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Description

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The present invention relates to a digital modulation method which converts 8-bit digital data into 14-bit digital modulation codes.

Conventional apparatuses, which use rotary heads to record digital data to magnetic tape or to reproduce digital data recorded on magnetic tape, utilize rotary transformers to record or reproduce the digital data: recording is performed by supplying the digital data to the rotary head through the rotary transformer; and reproduction is performed by reading the digital signal with the rotary magnetic head through the rotary transformer.

Consequently, If the reproduced signal includes a DC (Direct Current) component, the digital data cannot be correctly reproduced. For this reason, the digital data must be recorded by using a DC free digital modulation system.

Among the conventional DC free digital modulation systems, the following systems are well known.

The 8-10 modulation system, the DR (Density Ratio) of which is 0.8, is described in Japanese Patent Application Laying-Open No. 56-19506.

The M² modulation system, the DR of which is 1, is known.

The 8-14 modulation system, the DR of which is 1.14, is described in Japanese Patent Application Laying-Open No. 61-196469. This system provides up to four 14-bit digital modulation codes for each 8-bit digital data. When the CDS (Code word Digital Sum) of a 14-bit modulation code is zero, the code is paired with the reversal pattern thereof. When the CDS of a 14-bit digital modulation code is not zero, the code is grouped with the following three codes: another 14-bit modulation code the absolute value and sign of CDS of which differ from those of the above code; and the reversal patterns of the respective codes.

Here, CDS is defined as a DSV calculated from the first bit to the last bit of a modulation code: DSV (Digital Sum Value) is a total sum obtained by adding -1 for respective bits "0" in a series of digital modulation codes and by adding 1 for respective bits "1" in the same codes. The reversal pattern is a pattern obtained by reversing each bit in a code: bit "1" is reversed to "0", whereas bit "0" is reversed to "1".

Another digital modulation method for converting 8-bit digital data into 14-bit digital modulation codes is described in Patent Abstracts of Japan, vol. 11, no. 237 (E-528), 4 August 1988. According to that method, the number of consecutive bits in a leading block and in an end block of bits is ilmited to five or less, and the number of consecutive bits in a middle block of bits is restricted to a range between 2 and 10. The code satisfies the requirement that the digital sum value (DSV) for all bits in the modulation code is equal to or below a predetermined value.

The above-mentioned conventional modulation systems have the following problems.

The 8-10 modulation system is not appropriate to a high-density recording because of its low DR of 0.8.

The M² modulation system is restricted in its high density recording because of its DR of 1.

The 8-14 modulation system has up to 4 modulation codes for each 8-bit code, and the absolute value of CDS of the digital modulation codes are allowed up to 6. In addition, DSV at the end of each 14-bit digital modulation code in the code stream is allowed up to \pm 4, and DSV at each bit in a series of the 14-bit digital modulation codes is allowed up to \pm 9. Consequently, it is difficult to eliminate the DC component of the modulation codes in a short time, and hence, low frequency component must be adequately passed in a recording/reproducing system including the rotary transformer.

A further problem is presented in the 8-14 modulation system. Generally speaking, magnetizing depth on magnetic tape is about 1/4 of the magnetized wavelength. When recording signals are over-written on the tape, the following problem occurs: recording a new signal of the shortest magnetized wavelength on the longest magnetized wavelength which is 4 times or more longer than the shortest magnetized wavelength results in the erasing residue in the deeper part of the recording medium. This erasing residue appears during reproduction of the new signal, and so the over-writing is practically difficult.

Thus, the 8-14 modulation system suffers from the problem caused by the erasing residue when overwriting is performed because the number of consecutive identical bits ("0" or "1") in a 8-14 modulation code train is 2-9.

Incidentally, in the later description, the term "consecutive identical bits" means two or more consecutive identical bits: for example, "000" or "11".

It is therefore an object of the present invention to provide a digital modulation system which can solve the above problems: the digital modulation system that allows high density recording, that can reduce the DC component with high efficiency, and that can perform azimuth recording and over-writing.

In a first aspect of the present invention, there is provided a digital modulation method for converting 8-bit digital data into 14-bit digital modulation codes, the digital modulation method comprising:

step 1 for selecting up to four 14-bit digital modulation codes for each 8-bit digital data, the 14-bit digital

modulation code is selected by the procedures of

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- (a) selecting among the 2¹⁴ 14-bit digital codes, a digital code the numbers of consecutive identical bits in which are 5 or less in the first 6 bits, 2 7 from the second bit to 13th bit, and 6 or less in the last 7 bits, the absolute value of CDS of the selected digital code being 4 or less, and repeating this selecting procedure.
- (b) selecting among the selected 14-bit digital codes at the procedure (a), a digital code the first bit of which is "0", and the value of CDS of which is 0, and pairing the selected 14-bit digital code with the reversal code thereof to make the 2 digital codes one group, or selecting among the selected 14-bit digital codes at the procedure (a), a digital code the first bit of which is "1", and the value of CDS of which is +2 or +4, combining the selected 14-bit digital codes with the reversal codes thereof, and further combining the two 14-bit digital codes with a pair of 14-bit digital codes selected at the above procedure to make the 4 digital codes one group, and repeating this selecting procedure,
- (c) selecting among the selected 14-bit digital codes at the procedure (a), a digital code the first bit of which is "0", and the value of CDS of which is +2, and another digital code the first bit of which is "1", and the value of CDS of which is +2 or +4, and combining the two selected 14-bit digital codes with the reversal codes thereof to make the 4 digital codes one group, and repeating this selecting procedure,
- (d) selecting among the selected 14-bit digital codes at the procedure (a), a digital code the first bit of which is "0", and the value of CDS of which is +4, and another digital code the first bit of which is "1", and the value of CDS of which is +2, and combining the two selected 14-bit digital codes with the reversal codes thereof to make the 4 digital codes one group, and repeating this selecting procedure, and
- (e) selecting 256 groups among the groups formed in the above procedures as the 14-bit digital modulation codes;
- step 2 for selecting one group of 14-bit digital modulation codes among the 256 groups of the 14-bit digital modulation codes, the selected group corresponding to inputted 8-bit digital data;
- step 3 for further selecting one or more 14-bit digital modulation codes in the selected group at step 2, each of the 14-bit digital modulation codes satisfying the requirement that the number of consecutive identical bits at the joint portion of the preceding 14-bit digital modulation code already selected and the 14-bit digital modulation code to be selected is 2 7; and
- step 4 for further selecting one 14-bit digital modulation code among the selected modulation codes at step 3 so that the one 14-bit digital modulation code satisfies the requirement that the absolute value of the DSV at each bit of the modulation code (called bit DSV hereinafter) is equal to or less than 7.
- In a second aspect of the present invention, there is provided a digital modulation method for converting 8-bit digital data into 14-bit digital modulation codes, the digital modulation method comprising:
 - step 1 for selecting up to four 14-bit digital modulation codes for each 8-bit digital data, the 14-bit digital modulation code is selected by the procedures of
 - (a) selecting among the 2¹⁴ 14-bit digital codes, a digital code the numbers of consecutive identical bits in which are 6 or less in the first 7 bits, 2 7 from the second bit to 13th bit, and 5 or less in the last 6 bits, and repeating this selecting procedure,
 - (b) selecting among the 14-bit digital codes selected at the procedure (a), a digital code the first bit of which is "0", and the CDS of which has the absolute value equal to or less than 6, and repeating this selecting procedure,
 - (c) selecting among the 14-bit digital codes selected at the procedure (a), a digital code the first bit of which is "1", and the CDS of which has the absolute value equal to or less than 4, and repeating this selecting procedure,
 - (d) selecting among the 14-bit digital codes selected at the procedure (b), a digital code the value of CDS of which is 0, and pairing the selected 14-bit digital code with the reversal code thereof to make the 2 digital codes one group, and repeating this selecting procedure,
 - (e) selecting among the 14-bit digital codes selected at the procedure (b), a digital code the value of CDS of which is +2, +4 or +6, selecting among the 14-bit digital codes selected at the procedure (c), a digital code the value of CDS of which is +2 or +4, and combining the two selected 14-bit digital codes with the reversal codes thereof to make the 4 digital codes one group, and repeating this selecting procedure, and
 - (f) selecting 256 groups among the groups formed in the above procedures as the 14-bit digital modulation codes;

step 2 for selecting one group of 14-bit digital modulation codes among the 256 groups of the 14-bit digital modulation codes, the selected group corresponding to inputted 8-bit digital data;

step 3 for further selecting one or more 14-bit digital modulation codes in the selected group at step 2, each of the 14-bit digital modulation codes satisfying the requirement that the number of consecutive identical bits at the joint portion of the preceding 14-bit digital modulation code already selected and the 14-bit digital modulation code to be selected is 2 - 7; and

step 4 for further selecting one 14-bit digital modulation code among the selected modulation codes at step 3 so that the one 14-bit digital modulation code satisfies the requirement that the absolute value of the bit DSV of the modulation code is equal to or less than 8.

Fig. 1 is a block diagram showing a digital modulation apparatus for carrying out the digital modulation according to the first embodiment of the digital modulation method of the present invention;

Fig. 2 is a block diagram showing an embodiment of the decoding circuit;

Fig. 3A is a graph showing a carrier-to-noise ratio of a reproduced signal;

Fig. 3B is a graph showing a power spectrum of the first embodiment of the present invention;

Fig. 3C is a graph showing a power spectrum of the scrambled NRZ;

Fig. 4 is a view showing the number of 14-bit digital modulation codes whose CDS ≥ 0;

Fig. 5 is a view showing the number of 14-bit digital modulation codes whose CDS ≤ 0;

Fig. 6 is a block diagram showing a digital modulation apparatus for carrying out the digital modulation according to the second embodiment of the digital modulation method of the present invention;

Fig. 7 is a flowchart showing the modulation procedure of the digital modulation apparatus for carrying out the digital modulation according to the second embodiment;

Fig. 8 is a view showing the number of 14-bit digital modulation codes whose CDS ≥ 0; and

Fig. 9 is a view showing the number of 14-bit digital modulation codes whose CDS \leq 0.

The invention will now be described with reference to the accompanying drawings.

[A] FIRST EMBODIMENT

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Fig. 1 is a block diagram showing a digital modulation apparatus for carrying out the digital modulation according to the first embodiment of the digital modulation method of the present invention.

In Fig. 1, 8-bit digital data 1 is converted to a 14-bit digital modulation code by an encoder 2. An end pattern judgement portion 3 converts the end pattern of the last 6-bits of the 14-bit digital modulation code into a 4-bit code in Table 9 (although the last 8 bits of the modulation codes are given in Table 9, only the last 6 bits should be considered). A CDS calculation portion 5 computes the CDS of the 14-bit digital modulation code supplied, and converts the resultant CDS into a 3-bit code in Table 7. A DSV calculation portion 4 adds the CDS of the current 14-bit digital modulation code to the DSV at the end of the preceding 14-bit digital modulation code, yielding a new DSV, and converts the new DSV into a 2-bit code shown in Table 8.

A parallel-to-serial converter 8 converts the 14-bit digital modulation code into a serial signal in synchronism with a clock signal 9. A recording portion 10 records the serial modulation signal produced from the parallel-to-serial converter 8 on a recording medium such as magnetic tape or the like.

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TABLE 7

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CDS of modulation codes	Corresponding 3-bit codes
- 4	000
-2	001
0	010
2	011
4	100

TABLE 8

DSV at the end of the preceding modulation codes	Corresponding 2-bit codes
-2	00
0	01
2	10

TABLE 9

	1
End pattern of the preceding modulation code	Corresponding 2-bit codes
··· xxxxx110	0000
xxxx1100	0001
xxx11000	0010
xx110000	0011
x1100000	0100
11000000	0101
xxxxx001	0110
xxxx0011	0111
xxx00111	1000
••• xx001111	1001
x0011111	1010
00111111	1011
	the preceding modulation code xxxxx110 xxxx1100 xxx11000 xx110000 x1100000 x1100000 xxxx001 xxxx0011 xxx00111 xx001111

x: Don't care bit

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The output code of the CDS calculation portion 5 is supplied to the DSV calculation portion 4.

The DSV calculation portion 4 supplies the code to the encoder 2 via a latch 6. The end pattern judgement portion 3 supplies the code to the encoder 2 via a latch 7.

Next, the method for selecting a 14-bit digital modulation code corresponding to each inputted 8-bit digital data will be described.

First, the method for selecting up to four 14-bit digital modulation codes for each 8-bit digital data will be described. The 14-bit digital modulation code is selected by the procedures of

(a) selecting among the 2¹⁴ 14-bit digital codes, a digital code the numbers of consecutive identical bits in which are 5 or less in the first 6 bits, 2 - 7 from the second bit to 13th bit, and 6 or less in the last 7 bits, the absolute value of CDS of the selected digital code being 4 or less, and repeating this selecting proce-

dure.

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- (b) selecting among the selected 14-bit digital codes at the procedure (a), a digital code the first bit of which is "0", and the value of CDS of which is 0, and pairing the selected 14-bit digital code with the reversal code thereof to make the 2 digital codes one group, and repeating this selecting procedure, or selecting among the selected 14-bit digital codes at the procedure (a), a digital code the first bit of which is "1", and the value of CDS of which is +2 or +4, combining the selected 14-bit digital codes with the reversal codes thereof, and further combining the two 14-bit digital codes with a pair of 14-bit digital codes selected at the above procedure to make the 4 digital codes one group, and repeating this selecting procedure,
- (c) selecting among the selected 14-bit digital codes at the procedure (a), a digital code the first bit of which is "0", and the value of CDS of which is +2, and another digital code the first bit of which is "1", and the value of CDS of which is +2 or +4, and combining the two selected 14-bit digital codes with the reversal codes thereof to make the 4 digital codes one group, and repeating this selecting procedure,
- (d) selecting among the selected 14-bit digital codes at the procedure (a), a digital code the first bit of which is "0", and the value of CDS of which is +4, and another digital code the first bit of which is "1", and the value of CDS of which is +2, and combining the two selected 14-bit digital codes with the reversal codes thereof to make the 4 digital codes one group, and repeating this selecting procedure, and
- (e) selecting 256 groups among the groups formed in the above procedures as the 14-bit digital modulation codes.

Next, the selection procedure of a 14-bit digital modulation code (current modulation code) corresponding to inputted 8-bit data will be described.

First, the DSV at the end of the preceding modulation code is calculated, and the end pattern of the preceding modulation code is decided as one of the twelve end patterns shown in Table 9.

Subsequently, the current 14-bit digital modulation code is selected by the encoder 2 in response to the 8-bit data, the DSV at the end of the preceding modulation code, and the end pattern of the preceding modulation code.

More specifically, the following steps are taken for selecting the current 14-bit digital modulation code.

- (1) The 14-bit digital modulation codes satisfying the following conditions are selected from Tables 4 and 5: (a) the number of consecutive identical bits at the joint portion with the preceding 14-bit digital modulation code is two to seven; and (b) the absolute value of the DSV at the end of the digital modulation code (called end DSV hereinafter) is equal to or less than two.
- (2) When two or more 14-bit digital modulation codes are selected at step (1), the 14-bit digital modulation code that gives the least absolute value of the end DSV is chosen.
- (3) When two or more 14-bit digital modulation codes are still chosen in step (2), the 14-bit digital modulation code is selected by calculating the bit DSV of the modulation code, determining the bit DSV the absolute value of which is minimum for each modulation code, and choosing the code including the bit DSV whose minimum absolute value is minimum.
- (4) When two or more 14-bit digital modulation codes are further found in step (3), the 14-bit digital modulation code is selected by finding the maximum absolute value of the bit DSV of each modulation code, and choosing the code including the bit DSV whose maximum absolute value is equal to or less than six.
- (5) When two or more modulation code are still found in step (4), is selected the 14-bit digital modulation code satisfying the condition that the number of consecutive identical bits at the joint portion with the preceding 14-bit digital modulation code is equal to or less than six.
- (6) When any modulation codes selected at step (4) does not satisfy step (5), or two or more modulation codes satisfy step (5), is selected a 14-bit digital modulation code satisfying the condition that the consecutive identical bits in that modulation code is equal to or less than six.
- (7) When any modulation code selected at step (4) does not satisfy steps (5) and (6), or when any modulation code selected at step (5) does not satisfy step (6), or when two or more modulation codes are further found at step (6), the following steps are taken.
- (7a) When the end DSV of the modulation code is -2, the code of higher priority (corresponding to smaller number in Table 10) is selected according to Table 10. Likewise, when the end DSV of the modulation code is +2, the code of higher priority is selected according to Table 11.
- (7b) When two or more modulation codes belonging to the equal highest priority are found in step (7a), all of them are temporarily selected. When the end DSV is zero, is selected the modulation code satisfying the last six bits of which are not "...111111", nor "...000000" in the modulation codes.
- (8) When any modulation code selected at step (4) does not satisfy steps (5), (6) and (7), or when any modulation code selected at step (5) does not satisfy step (6) and (7), or when any modulation code selected at step (6) does not satisfy step (7), or when two or more modulation codes are further found at step (7), is selected the modulation code including the bit DSV whose maximum absolute value is minimum.

(9) When two or more modulation codes are still found at step (8), is selected the modulation code including the bit DSV whose minimum absolute value appears fastest in the bit string of the modulation code.(10) When two or more modulation codes are further found at step (9), is selected the modulation code whose bit will be reversed fastest after the joint point with the preceding modulation code.

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TABLE 10

In the case where DSV at the end of modulation code is "-2"

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End pattern of modulation codes	Priority
xxxxx001	4
xxxx0011	1
xxx00111	2
xx001111	3
x0011111	8
··· xxxxx110	10
xxxx1100	5
xxx11000	6
xx110000	7
x1100000	9
11000000	11
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x: Don't care bit

TABLE 11

In the case where DSV at the end of modulation code is "+2"

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End pattern of modulation codes	Priority
··· xxxxx110	4
··· xxxx1100	1
xxx11000	2
xx110000	3
x1100000	8
··· xxxxx001	10
xxxx0011	5
xxx00111	6
xx001111	7
×0011111	9
00111111	11

x: Don't care bit

The 14-bit digital modulation code thus selected is fed to the parallel-to-serial converter 8. The modulation code entered the parallel-to-serial converter 8 is serially read out in synchronism with the clock 9, and is fed to the recording portion 10, where the 14-bit digital modulation code is recorded on the recording medium such as magnetic tape or the like.

On the other hand, the 14-bit digital modulation code selected by the encoder 2 is supplied to the DSV calculation portion 4, and to the end pattern judgement portion 3. The DSV calculation portion 4 adds the CDS of the current modulation code to the DSV at the end of the preceding modulation code to obtain a new DSV. The new DSV is converted into a 2-bit code according to Table 8, and is supplied to the encoder 2 through latch 6. The end pattern judgement portion 3 converts the last 6 bits of the 14-bit modulation code into a 4-bit code according to Table 9, and supplies the 4-bit code to the encoder 2 through latch 7.

The above procedure is repeated for every 8-bit input data. Thus, a 14-bit digital modulation code train is obtained, in which the number of consecutive identical bits is restricted to 2 - 7, and the absolute value of the

DSV is restricted equal to or less than 7.

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Fig. 2 shows an example of the decoding circuit. In Fig. 2, reference numeral 11 designates a reproducing portion, 12 designates a synchronizing signal detector, 13 denotes a serial-to-parallel converter, and 14 denotes a decoder. The decoding procedure by the decoding circuit will now be described.

The serial modulation code reproduced by the reproducing portion 11 is supplied to the synchronizing signal detector 12 and the serial-to-parallel converter 13. The synchronizing signal detector 12 detects the synchronizing signal inserted at the beginning of the synchronizing block, and supplies it to the parallel-to-serial portion 13. The synchronizing signal is used to synchronize with each 14-bit digital modulation code. The serial-to-parallel converter 13, using the synchronizing signal from the synchronizing signal detector 12, converts the serial 14-bit digital modulation code to a parallel 14-bit digital modulation code, and supplies it to the decoder 14. The decoder 14 decodes the 14-bit digital modulation code into corresponding 8-bit data by using a ROM.

Next, the 14-bit digital modulation code produced from the encoder 2 in Fig. 1 will be described.

The 14-bit digital modulation code converted from the 8-bit code satisfies the following requirements.

- (1) The number of consecutive identical bits in the first 6 bits is equal to or less than 5.
- (2) The number of consecutive identical bits included from the second bit to the 13th bit is 2 7.
- (3) The number of consecutive identical bits included in the last 7 bits is equal to or less than 6.
- (4) The absolute value of CDS of the modulation code is equal to or less than 4.

The end patterns of the modulation codes that satisfy the above requirements (1) to (4) are summed up as the following 12 items (A) - (M).

	(A)		110
25	(B)	••• •••	1100
	(C)		11000
	(D)		110000
	(E)		1100000
30	(F)	••• •••	11000000
	(G)		001
	(H)		0011
35	(J)		00111
	(K)	••• •••	001111
	(L)	••• •••	0011111
	(M)	••• •••	00111111
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The beginning of the modulation code succeeding to the modulation codes (A) - (M) is one of the following items.

First, the beginning of the modulation code succeeding to the modulation code (A) is one of the following five items (A1) - (A5).

(A1)	011
(A2)	0011
(A3)	00011
(A4)	000011
(A5)	0000011
	(A2) (A3) (A4)

Second, the beginning of the modulation code succeeding to the modulation code (B) is one of the following nine items (B1) - (B9).

	(B1) 01	1	•••	• • •	
	(B2) 00	11	•••	•••	
_		011	•••	•••	
5	(B4) 00	0011	• • •	•••	
	(B5) 00	00011	•••	•••	
	(B6) 11	00	• • •	• • •	
10	(B7) 11	100	•••	•••	
	(B8) 11	1100	•••	•••	
	(B9) 11	11100	•••	•••	
15	5				•
	The beginning of the modulation code succ items (C1) - (C8) .	eeding to the	mod	lulatio	n code (C) is one of the following eight
20	(C1) 01	1	•••	•••	
	(C2) 00	11	•••	•••	
	(C3) 00	011	• • •	•••	
25	(C4) 00	0011	•••	•••	
		00	•••	•••	
	(C6) 11	100	•••	•••	
	(C7) 11	1100	•••	•••	
30	(C8) 11	11100	•••	•••	
35	The beginning of the modulation code succeitems (D1) - (D7).	eeding to the	modi	ulatio	n code (D) is one of the following seven
		1	•••	•••	
	(D2) 00	11	• • •	•••	
	(D3) 00	011	•••	•••	
40)				
	(D4) 11	00		•••	
45	(D5) 11	100	•••		
		1100	• • •	•••	
	(D7) 11	11100	•••	•••	
50	The beginning of the modulation code succ	ceeding to the	e mo	dulati	on code (E) is one of the following six

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items (E1) - (E6).

	(E1)	011
	(E2)	0011
5	(E3)	1100
	(E4)	11100
	(E5)	111100
10	(E6)	1111100

The beginning of the modulation code succeeding to the modulation code (F) is one of the following five items (F1) - (F5).

The beginning of the modulation code succeeding to the modulation code (G) is one of the reversal patterns of the modulation codes (A1) - (A5).

The beginning of the modulation code succeeding to the modulation code (H) is one of the reversal patterns of the modulation codes (B1) - (B9).

The beginning of the modulation code succeeding to the modulation code (J) is one of the reversal patterns of the modulation codes (C1) - (C8).

The beginning of the modulation code succeeding to the modulation code (K) is one of the reversal patterns of the modulation codes (D1) - (D7).

The beginning of the modulation code succeeding to the modulation code (L) is one of the reversal patterns of the modulation codes (E1) - (E6).

The beginning of the modulation code succeeding to the modulation code (M) is one of the reversal patterns of the modulation codes (F1) - (F5).

The numbers of the modulation codes that satisfy the requirements (1) - (4) are shown in Tables 1 and 2. The code "10000000111111" (CDS = 0), and the code "01111111000000" (CDS = 0) are excluded from the numbers.

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TABLE 1

	Beginning pattern of	The number of possible modulation codes							
10	modulation codes		C	DS Va	lue				
		-4	-2	0	2	4	Total	CDS ≤	CDS ≥ 0
15	0000011	9	.8	6	0	0	23	23	6
	000011	12	14	10	6	0	42	36	16
20	00011	15	21	20	11	5	72	56	36
	0011	17	29	33	26	11	116	79	70
25	011	17	37	49	47	32	182	103	128
30	Total	70	109	118	90	48	435	297	256

TABLE 2

5	Beginning	attern of .								
10	modulation codes		C	,						
,,		-4	-2	0	.2	4	Total	CDS ≤ 0	CDS ≥ 0	
15	1111100	0	0	6	8	9	23	6	23	
	111100	0	. 6	10	14	12	42	16	36	
20	11100	5	11	20	21	15	72	36	56	
	1100	11	26	33	29	17	116	70	79	
25	100	32	47	49	37	17	182	128	103	
30	Total	48	90	118	109	70	435	256	297	

More than 256 modulation codes whose CDS \ge 0, and more than 256 modulation codes whose CDS \le 0 are necessary, which follow one of the modulation codes (A) - (M). In addition, the converted modulation code must correspond to one 8-bit data to avoid transmission error.

The number of modulation codes that can succeed one of the modulation codes (A) - (M) is shown in Table 3.

For example, the CDS of the modulation codes that terminate with "...00111111" is "2" or "4". Accordingly, the end DSV of the modulation code takes a value of "0" or "2", and so the succeeding modulation code must satisfy the requirements that its CDS \leq 0, and it must begin with any one of the bit train "0000011", "000011, "00011", "0011", and "100". The number of the modulation codes that satisfy the requirements are 322 as shown in Table 3, which is greater than the necessary number of 256.

Likewise, the CDS of the modulation codes that terminate with "...11000000" is "-2" or "-4". Accordingly, the end DSV of the modulation code takes a value of "0" or "-2", and so the succeeding modulation code must satisfy the requirements that its CDS \geq 0, and it must begin with any one of the bit train "1111100", "11100", "11100", "1100", and "011". The number of the modulation codes that satisfy the requirements are 322 as shown in Table 3, which is greater than the necessary number of 256.

TABLE 3

End pattern of modulation codes		The number of possible successive modulation codes								
			CDS	Valu	e					
	-4	-4 -2 0 2 4 Total						CD ≥		
110	70	109	118	90	48	435	297	25		
1100	86	152	187	162	101	688	425	4.5		
11000	77	144	181	162	101	665	402	4.		
110000	65	130	171	156	101	623	366	43		
1100000	50	109	151	145	96	551	310	3:		
11000000	33	80	118	119	85	435	231	3:		
001	48	90	118	109	70	435	256	2		
0011	101	162	187	152	86	688	450	4:		
00111	101	162	181	144	77	665	444	4		
001111	101	156	171	130	65	623	428	3		
0011111	96	145	156	109	50	550	392	3		
00111111	85	119	118	80	33	435	322	2		

Fig. 4 shows the number of modulation codes of respective classes when CDS \geq 0, and Fig. 5 shows the number of modulation code of respective classes when CDS \leq 0.

Tables 4 and 5 show the correspondence between the 8-bit data and the modulation codes: Table 4 shows the correspondence when CDS \ge 0; and Table 5 shows the correspondence when CDS \le 0.

55

Table 4 (CDS ≥ 0)

	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class	8-bit data	Modulation codes beginning with "1"	CDS
5		0 1 2	01111110000001 01111100110000 01111100011000	000		0 1 2	10000001111110 10000011001111 10000011100111	0
10		23456780	01111100001100 01111100000110 011111000000	000000		2 3 4 5 6 7 8 9	10000011110011 10000011111001 100000111111	0 0 0 0
15		9 10 11 12 13 14	01111000011100 01111000011001 01111000001110 011110011110000 01110011100001	00000		10 11 12 13 14 15	10000111001110 1000011110011 1000011110011 1000011111000 10000111111	000000
20		16 17 18 19 20 21	01110011001100 01110011000110 01110011000011 0111000111000 01110001110001 01110001100011	000000		16 17 18 19 20 21 21	10001100110011 10001100111001 10001100111100 1000111000111 10001110011101 10001110011001	000000
25		23 24 25 26 27 28 29	01110000111100 01110000111001 01110000110011 01110000011110 0111000000	000000		23 24 25 25 26 27 28 29	10001111000011 10001111000110 10001111001100 10001111100001 1000111111	00000
30	1 (A)	30 31 32 33 34	01100111001100 01100111000110 01100111000011 01100110011100 01100110011001	00000	1 (B)	30 31 32 33 34 35	10011000110011 10011000111001 10011000111100 10011001100011	0000
35		35 36 37 38 39 40 41	01100110001110 01100110000111 01100011111000 01100011110011 0110001110011 0110001100011	000000		36 37 38 39 40 41	10011001110001 10011001111000 1001110000111 1001110001110 1001110001100 1001110001100	000000
40		42 43 44 45 46 47	01100011000111 01100001111100 01100001111001 01100001110011 01100001100111	000000		42 43 44 45 46 47	10011100111000 10011110000011 10011110000110 10011110001100 10011110011000	00000
45		48 49 50 51 52 53	01100000011111 01111111001100 011111111	044444		48 49 50 51 52 53	10011111100000 10000011111110 10000110011111 10000111001111 10000111100111	022222222
50		54 55 56 57 58 59	01111110001110 01111110000111 01111100111100 01111100111001 01111100111011	444444		54 55 56 57 58 59	10000111111001 10000111111100 10001100011111 10001100111110 10001110001111	2 2 2 2 2
55		60 61 62 63	01111100001111 01111001111100 01111001111001 01111001110011	444		60 61 62 63	10001111000111 10001111001110 10001111100111 10001111100110	2 2 2 2

Table 4 (CDS ≥ 0)

		8-bit	Modulation codes			8-bit	Modulation codes	
	Class	data	beginning with "0"	COS	Class	data	beginning with "1"	CDS
5								
	!	64 65	01111001100111	4	i 1	64 65	10001111110001	2 2
		.66	01111000011111	i		66	10011000011111	2
		67	01110011111100	į,		67	1.0011000111110	2
		68	01110011111001	4		68	10011001100111	2
10		69	01110011110011	•	i i	69 70	10011001110011	2 2
		70 71	01110011100111	4		71	10011001111001	2
		72	01110001111110	4		72	10011100001111	2
		73	01110000111111	4		73	10011100011110	2
		74	011001111111100	4		74	10011100110011	2
15	1	75 76	01100111111001	4.	l '	75 76	10011100111001	2 2 2
		77	01100111100111	i		77	10011110000111	
		78	01100111001111	4		78	10011110001116	2 2 2
	1	79	01100110011111		1 (B)	79	10011110011001	2 2
]	80 81	01100011111110	4		80 81	100111110011100	2
20		82	01111110011000	2 2 2		82	10011111000110	2
		83	01111110001100	2		83	10011111001100	2
		84	011111110000110	2		84 85	100111111100001	2
		85 86	01111110000011	2 2		86	10011111110000	2 4
	'	87	01111100110001	1 2		87	10001111100111	4
25	i	88	01111100011100	2		88	10001111110011	4.
	1	89	01111100011001	2	•	89 90	10011001111110	4
	1	90 91.	011111100001110	2	ŀ	91	10011110001111	4
		92	01111001111000	2 2		92	10011110011110	4
	1	93	01111001110001	12		93	10011111000111	4
30	1	94	01111001100110	2		94	10011111001110	1
		95 96	01111001100011	2 2		96	10011111100110	1 4 1
	l	97	01111000111001	2		97	11000111100111	4
	1 (A)	98	01111000110011	2		98	11000111110011	4
	ł	99	01111000011110	2		99	11000000111111	2 2
35	l	100 101	01111000001111	2 2	l	100	110000011111110	2
	1	102	01110011110001	2		102	11000011100111	2
	1	103	01110011100110	2	ŀ	103	11000011110011	2
	1	104	01110011100011	2	l	104	11000011111001	2 2
		105	01110011001110	2 2	•	105 106	11000011111100	5
40		107	01110001111100	2	1	107	11000110011110	2 2
		108	01110001111001	2	2 (B)	108	11000111000111	2
		109	01110001110011	2	2(0)	109	11000111001110	2
	i	110	01110001100111	2 2	1	1110	11000111100011	2 2
		112	01110000011111	2		112	11000111110001	2
45	į.	113	01100111111000	2.	1	113	11000111111000	2
		114	01100111110001	2		114 115	11001100001111	2
	}	115 116	01100111100110	2		116	11001100110011	2
		117	01100111001110	2 2 2 2		117	11001100111001	22222222222222222
		118	01100111000111	2	1	118	11001100111100	2
50		119	01100110011110	2		119	11001110000111	2
		120	01100110001111	2	ł	120 121	11001110001110	
		121 122	01100011111001	2 2	Ī	122	11001110011100	2
		123	01100011110011	2	l	123	11001111000011	2
		124	01100011100111	2	1	124	11001111000110	2
55		125	01100011001111	2		125	11001111001100	2
55		126	01100001111110	2 2	i	126	11001111100001	2 2
		 '4'	101100000111111	 -	4	1	1	, -

Table 4 (CDS \geq 0)

	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class	8-bit data	Modulation codes beginning with "1"	CDS
5		128 129	00111111100000	0		128	11000000011111	0
		130 131	00111110011000	000		129 130 131	11000000111110 11000001100111 11000001110011	0 0
10		132 133	00111110000110	0 0		132 133	11000001111001	0
		134 135 136	00111100111000 00111100110001 00111100011100	000		134 135 136	11000011000111 11000011001110 11000011100011	0
		137 138	00111100011001	000		137 138	11000011100110	0
15		139 140 141	00111100000111	000		139 140 141	11000011111000	0
		142	00111001110001 00111001100110 00111001100011	000	2 (B)	142 143	11000110001110 11000110011001 11000110011100	0
		144 145	00111000111100	00		144	11000111000011	0
20		146 147 148	00111000110011	000		146 147 148	11000111001100 11000111100001 11000111110000	0
		149 150	00110011111000	0		149 150	11001100000111	0
25		151 152 153	00110011100110	000		151 152 153	11001100011001 11001100011100 11001100110001	0
		154 155	00110011000111	00		154 155	11001100111000	0
		156 157 158	00110001111001	000		156 157 158	11001110000110	0 0
30		159 160	00110000111110	0		159 160	11001111000001	0
	2 (A)	161 162 163	00111111100001 001111111001100 001111111	2 2 2		161 162 163	11001100111110 11001110011110 11001111000111	4
35		164 165	00111111000011	2222		164 165	11001111001110	4
		166	00111110011001	223		166 167 168	11001111100110 11100001111110 11100011100111	4
		168 169 170	00111110000111	2 2 2 2		169 170	11100011110011	4
40		171 172	00111100110011	2	3 (B)	171 172	11100110011110 11100111000111	4
		173 174 175	00111100001111	2 2 2		173 174 175	11100111001110	4
45		176 177	00111001110011	2 2		176 177	11100111111000 11100000011111	4
••		178 179 180	00111000111110	2 2 2		178 179 180	11100000111110 11100001100111 11100001110011	2 2 2
		181 182	00110011111001	22222222		181 182	11100001111001	2 2
50		183 184 185	00110011100111	2 2 2		183 184 185	11100011000111 11100011001110 11100011100011	2222222222222222
		186 187	00110000111111	2 4		186 187	11100011100110	2 2
		188 189	00111111100011	4		188 189	111000111111000	2 2
5 5		190 191	00111111000111	4		190 191	11100110001110	2

Table 4 (CDS \geq 0)

		0 545	[160 4 - 1 - 1 - 1 - 1 - 1			0 545	Modulation codes	
	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class	8-bit data	beginning with "1"	CDS
5		192	00111110001111	$\overline{}$				
		193	00111100111110	1		192 193	11100110011100	2 2
		194	00111100011111	1	l i	194	11100111000110	2
		195	00111001111110	4		195	11100111001100	2
	2 (A)	196	00111000111111	- •		196	11100111100001	2 2 2
10		197 198	0011001111110 00011111110000	4		197 198	111001111110000	0
10	<u> </u>	199	00011111100001	ŏ.	i	199	11100000011110	ŏ
		200	00011111001100	Ŏ		200	11100000110011	0
		201	00011111000110	0	2/01	201	11100000111001	0
	1	202	00011111000011	0	3 (B)	202	11100000111100	0
		203	00011110011100	0		203	11100001100011	0
15	i I	204 205	00011110001110	Ö		204 205	11100001100110 11100001110001	ŏ
		206	00011110000111	ŏ		206	11100001111000	ŏ
		207	00011100111100	Ŏ		207	11100011000011	0
		208	00011100111001	0		208	11100011000110	0
	1	209	00011100110011	0		209	11100011001100	0
20		210 211	00011100011110	0		210 211	11100011100001	0
		212	00011001111100	ŏ		. 212	11100110000011	ŏ
		213	00011001111001	Ŏ		213	11100110000110	0
		214	00011001110011	0		214	11100110001100	0
	3(A)	215	00011001100111	0		215	11100110011000 11100111000001	0
25		216 217	00011000111110	ŏ	Į,	216 217	11100111100000	Ö
	Į l	218	00011111110001	2		218	11110001111100	4
	1 1	219	00011111100110	2		219	11110011111000	4
	1	220	00011111100011	2	1	220	111110000001111	2
	1 1	221 222	00011111001110	2 2		221	1111100000111110	2
	·	223	00011110011110	2	į į	223	11110000111001	222222222222
30	1	224	00011110001111	2 2	ļ	224	11110000111100	2
		225	00011100111110	2	.,,,,	225	111110001100011	2
		226	00011100011111	2	4 (B)	226 227	111110001100110	2
		227 228	00011001111110	2	1	228	11110001111000	2
		229	00011111110011	ī		229	11110011000011	2
35	1 1	230	00011111100111	4		230	11110011000110	2
	1	231	00011111001111	4		231	11110011001100	2
	ľ	232	00011110011111	4		232 233	111110011100001	2
	 	233 234	00001111111000	0	1	234	111100000000111	5
	1	235	00001111110001	ŏ	1	235	11110000001110	Ŏ
40	1	236	00001111100110	0		236	11110000011001	0
	4 (A)	237	00001111100011	0		237	11110000011100	0
	1	238	00001111001110	0	1	238	11110000110001	0
		239 240	00001111000111	ŏ	1	239 240	11110001100001	
		241	00001110001111	ŏ	ł	241	11110001110000	ŏ
45		242	00001100111110	Ō	I	242	11110011000001	0
		243	00001100011111	0		243	11110011100000	1 2
		244	00001111111001	2 2	1	244	111111000000111	2 2
	1	245 246	00001111100111	2	I	246	11111000011001	2
		247	00001111001111	2		247	11111000011100	2
50		248	00001110011111	2		248	11111000111000	2 2 2 2
		249	00001100111111	-2-	5 (B)	249	11111001110000	0
		250 251	00000111111100	0		250 251	111111000000011	0
		252	00000111110011	۱ŏ	I	252	11111000001100	ŏ
	5 (A)	253	00000111100111	ŏ	ŀ	253	11111000011000	Ŏ
	1	254	00000111001111	0	1	254	11111000110000	0
55	1	255	00000110011111	0 .	<u> </u>	255	11111001100000	0

Table 5 (CDS \leq 0)

	Class	8-bit	Modulation codes	CDS	Class	8-bit	Modulation codes	CDS
_	Class	data	beginning with "0"		CIASS	data	beginning with "1"	CIS
5		0	01111110000001	0		0 1	100000011111110	0
		2	01111100011000	0		2	10000011100111	0
	1	3 4	01111100000110	00		3 4	10000011110011	0
10		5 6	01111100000011	0		5 6	100000111111100	0
10		7	01111001100001	0		7	10000110011110	0
		8 9	01111000111000	0 0		8 9	10000111000111	0
		10 11	01111000011100	0		10 11	10000111100011	0
15		12	01111000001110	0		12	10000111110001	0
		13 14	01111000000111	0		13 14	10000111111000	0
		15 16	01110011100001	0	1	15 16	10001100011110	0 0
		17	01110011000110	0		17	10001100111001	0
20		18 19	01110011000011	0		18 19	10001100111100 10001110000111	0
		20 21	01110001110001	0		20 21	10001110001110	0
		22	01110001100011	Ó	. .	22	10001110011100	Ö
		23 24	01110000111100	.0		23 24	10001111000011	0
25		25 26	01110000110011	0		25 26	10001111001100	0
		27	01110000001111	0		27	10001111110000	0
		28 29	01100111110000	0		28 29	10011000001111	0
		30 31	01100111001100	0		30 31	10011000110011	0
30		32	01100111000011	0		32	10011000111100	0
	1 (C)	33 34	01100110011100		1 (D)	33 34	10011001100011	0
		35 36	01100110001110	0		35 36	10011001110001	0
35		37	01100011111000	0		37	10011,100000111	0
33		38 39	01100011110001	0		38 39	10011100001110	0
		40	01100011100011	0		40 41	10011100011100	0
		41	01100011000111	0		42	10011100111000	0
40		43 44	01100001111100	0		43 44	10011110000011	0
		45	01100001110011	0	•	45 46	10011110001100	0
		46 47	01100000111110	0		47	10011111000001	0
		48 49	01100000011111	0 -2		48 49	10011111100000 10000000110011	-4
45		50 51	01111001100000	-2 -2		50 51	10000000111001	-4
		52	01111000011000	-2		52	10000001100011	-4
		53 54	01111000001100	-2 -2		53 54	10000001100110	-4
		55	01111000000011	-2		55 56	10000001111000	-4
50		56 57	01710011000001	-2 -2		57	10000011000110	-4
		58 59	01110001110000	-2 -2		58 59	10000011001100	- 4
		60	01110000111000	-2		60	10000011110000	-4
		61 62	01110000110001	-2 -2		61 62	10000110000011	-4
55		63	01110000011001	-2		63	10000110001100	-4

Table 5 (CDS \leq 0)

	Class	8-bit data	Modulation codes	cos	Class	8-bit	Modulation codes	CDS
5		64	beginning with "0" 01110000001110		-	data 64	beginning with "1" 10000110011000	-6
-		65 66	01110000000111	-2		65 66	10000111000001	-4
		67 68	01100111000001	-2 -2		67	10000111100000	-4
		69	01100110011000	-2		68 69	10001100000110	-4
10		70 71	01100110000110	-2		70 71	10001100011000 10001100110000	-:
		72 73	01100011110000	-2 -2		72 73	10001110000001 10001111000000	- <u>4</u>
		74 、 75	01100011001100	-2 -2		74 75	10011000000011	-4
15		76 77	01100011000011	-2 -2		76 77	10011000001100	-4 -6
	1 (C)	78 79	01100001110001	-2		78 79	10011000110000	- i
	110)	80	01100001100011	-2 -2		80	10011100000001	-4
20		81 82	01100000111100	-2 -2		81 82	10000000111110	-2
20		83 84	01100000110011	-2 -2		83 84	10000001110011	-2 -2
		85 86	01100000001111	-2 -4		85 86	10000001111100	-2 -2
		87 88	01110000011000	-4 -4		87 88	10000011001110	-2 -2
25		89 90	01100110000001	-4		89 90	10000011100110 10000011110001	-2 -2
		91 92	01100001110000	- i - i		91 92	10000011111000	-2 -2
		93 94	01100000111000	-4		93 94	10000110001110	-2 -2
30		95 96	01100000011100			95 96	10000110011100	-2 -2
		97 98	00111000011000	-4	1 (D)	97 98	10000111000110	-2 -2
		99	00111111000000	-4	1(0)	99	10000111100001	-2 -2
•		100	00111110000001	-2		101	10001100000111	-2
35		102	00111100011000	-2 -2		102 103	10001100001110	-2 -2
		104	00111100000110	-2 -2		104	10001100011100	-2 -2
		106 107	00111001110000	-2 -2		106 107	10001100111000	-2 -2
40		108	00111000111000	-2 -2		108 109	10001110000110	-2 -2
	2(0)	110	00111000011100	-2 -2		110 111	10001110011000	-2 -2
	2 (C)	112	00111000001110	-2		112 113	10001111100000	-2 -2
45		114	00110011110000	-2 -2		114	10011000001110	-2
		115	00110011100001	-2 -2		115	10011000011001	-2 -2
		117	00110011000110	-2 -2		117	10011000110001	-2 -2
		119 120	00110001111000	-2 -2		119 120	10011001100001	-2 -2
50		121 122	00110001100110	-2 -2		121 122	10011100000011	-2 -2
		123 124	00110000111100	-2. -2		123 124	10011100001100	-2 -2
		125 126	00110000110011	-2 -2		125 126	10011100110000	-2 -2
55		127	00110000001111	-2		127	10011111000000	-2

Table 5 (CDS \leq 0)

Class data Seyining with "or Class data Seyining with "ar Class data Seyining with "ar Class Seyining with "ar Seyining with "									
128		Class	8-bit data		CDS	Class	8-bit	Modulation codes	CDS
129									
130	5	ŀ							
10				00111110011000					
10				00111110001100	-			11000001110011	0
134				00111110000110					
135				00111110000011		į			
136	10	1		00111100110001					
138				00111100011100	0			11000011100011	0
150						1			
140									
2(C)		1 1	140	00111001111000					
2(C)	15								
144 001110001111001 0	!	2/0							
145		2(0)		00111000111100					
147				00111000111001	0		2 2 -		
148									
149	20								
151			149	00110011111000			149	11001100000111	0
152								1 : : : : : : : : : : : : : : : : : : :	
153									
154				1			153		
156	25				0				
30 157 0011000110011 0 157 1100111001100 0 159 0011000011111 0 160 00110000011111 0 161 0011001000001 -4 162 0011000110000 -4 163 0011000011000 -4 164 0011000011000 -4 165 0011000011001 -4 165 00110000011001 -4 166 00110000011001 -4 166 0011000001100 -4 166 0011000001100 -4 167 100000011100 -2 168 0001110001000 -4 168 100000111000 -2 169 0001110001001 -4 170 110000001100 -2 171 000110000100 -4 170 1100001100110 -2 171 000110000100 -4 170 110000110010 -2 171 000110000110 -4 171 1100001100010 -2 172 0001100001100 -4 174 1100011000011 -2 175 000110000110 -4 176 11000011000010 -2 177 00011110000010 -4 176 1100011000011 -2 177 170 11000110000011 -2 178 0001110000011 -4 176 11000110000011 -2 177 170]							
158		!!					1111		
160			158		0		2 2 2		
161	20								
162	30								
163		1		00110001100001		2(D)			-2
165		1 1		00110000111000					
166									1
40 167 168 100011100011000 169 100011100001010 170 170 171 171 171 172 172 173 173 174 175 175 176 177 177 177 177 177 177 177 177 177	35					•	166	11000001100110	
40 169 00011100001100			167	00011110000001					
40 170									- 1
40 171		!							
3(C) 173		, ,			-4				
45 46 47 48 48 48 49 49 40 40 174 175 176 177 177 177 177 178 178 179 179	40	1							
45 3(C) 175		1						11000110000011	
45 176		3(0)					175	11000110000110	-2
45 178		**,		1 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7					
179									
50 180	45								
50 182			180	00011110001100					= 1
50 183						.			
50 184									_
185 00011100011100 -2 185 11001110000001 -2 186 110011110000001 -2 187 00011100001110 -2 188 11000000011001 -4 189 00011001111000 -2 189 11000000111000 -4 190 11000000111000 -4 190 11000000111000 -4 190 11000000111000 -4 190 11000000111000 -4 190 11000000111000 -4 190 11000000111000 -4 190 11000000111000 -4 190 11000000111000 -4 190 11000000111000 -4 190 11000000111000 -4 190 11000000111000 -4 190 110000000111000 -4 190 110000000111000 -4 190 110000000111000 -4 190 110000000111000 -4 190 110000000111000 -4 190 110000000111000 -4 190 110000000111000 -4 190 110000000111000 -4 190 1100000000111000 -4 190 1100000000111000 -4 190 1100000000111000 -4 190 1				00011100110001			184	11001100110000	-2
187	50				-2				
188									
189									
	i		189	00011001111000	-2		189		
	E E								
		1 1	171	1 200 1 100 1 100 1 10	-2]	'''		

Table 5 (CDS \leq 0)

	Class	8-bit	Modulation codes	CDS	Class	8-bit	Modulation codes	CDC
5	C1033	data	beginning with "0"	CLS	Class	data	beginning with "1"	CDS
3		192 193	00011001100011	-2		192	11000001110000	-4
		194	00011000111100	-2 -2		193 194	11000011000001	-4
		195	00011000110011	-2		195	11000110000001	-4
		196 197	00011000011110	-2 -2	2 (D)	196 197	11000111000000	-4 -4
10		198	00011111110000	0		198	11100000001111	Ö
		199 200	00011111100001	0		199 200	11100000011110	0
	0 (0)	201	00011111000110	ŏ		201	11100000111001	ŏ
	3 (C)	202 203	00011111000011	0		202	11100000111100	0
15		204	1 00011110011001	0		203 204	11100001100011	00
•		205	00011110001110	0		205	111100001110001	0
		206 207	00011110000111	0		206 207	11100001111000	00
		208	00011100111001	0		208	11100011000110	0
20		209 210	00011100110011	0		209 210	11100011001100	00
20		211	00011100001111	0		211	11100011110000	0
		212 213	00011001111100	0		212 213	11100110000011	0
		214	00011001110011	0		214	111100110001100	0
	'	215 216	00011001100111	00	3 (D)	215 216	11100110011000	0
25		217	00011000011111	0		217	11100111100000	0
		218 219	00001110000011	÷ ÷		218 219	11100000001110	-2. -2
		220	00001111110000	-2		220	11100000011100	-2
		221 222	00001111100001	-2		221 222	11100000110001 11100000111000	-2 -2
30		223	00001111000110	-2 -2		223	11100001100001	-2
		224	00001111000011	-2		224 225	11100001110000	-2
	4 (C)	225 226	00001110011100 00001110011001	-2 -2		226	11100011000001 11100011100000	-2 -2
		227	00001110001110	-2		227	11100110000001	-2
05		228 229	00001110000111	-2 -2		228 229	11100111000000 11100000001100	-2
35		230	00001100111001	-2		230	11100000011000	-4
		231 232	00001100110011 00001100011110	-2 -2		231 232	11100000110000 11100001100000	-4
		233	00001100001111	-2		233	11100011000000	-4
		234 235	00001111111000 00001111110001	00		234 235	11110000000111 11110000001110	0
40		236	00001111100110	0		236	11110000011001	0
		237 238	00001111100011	0 0		237 238	11110000011100	0
		239	00001111000111	0		239	11110000111000	0
		240	00001110011110	O,		240	11110001100001	0
45		241 242	00001110001111	0	4 (D)	241 242	11110001110000	0
		243	00001100011111	0	'-',	243	11110011100000	0
		244 245	00000111111000	-2 -2		244 245	11110000000110	-2 -2
		246	00000111100110	-2		246	11110000011000	-2
E0.		247	00000111100011	-2		247 248	11110000110000	-2 -2
50		248 249	00000111000111	-2 -2		249	11110011000000	-2
	5 (C)	250	00000111111100	0		250	11111000000011	0
		251 252	00000111111001	0		251 252	11111000000110	0
		253	00000111100111	0	5 (D)	253	11111000011000	0
55		254 255	00000111001111	0		254 255	111111000110000	0

The modulation codes in 5(B) of Table 4 can be changed as shown in Table 12 to improve the end DSV: the six modulation codes whose CDS = 0 in 5(B) is reduced to four by two, and two new modulation codes which have not been used and whose CDS = 2 are added.

Modulation codes

CDS

8-bit data

TABLE 12

Selecting a modulation code whose CDS = 2 makes it possible to adjust the end DSV at the end of the selected modulation code to 0, when the end DSV at the end of the preceding modulation code is -2, the last bit pattern of the preceding code is any one of the patterns "01", "100", "1000", "10000", "100000", and "1000000", and the signal data is 250 or 251. The modulation codes in 5(C) of Table 5, which are the reversal codes of those in 5(B) of Table 4, can also be changed as shown in Table 13.

TABLE 13

8-bit data	Modulation codes	CDS
248	00000111001110	-2
249	00000111000111	-2
250	00000110011110	-2
251	00000110001111	-2

Modulation codes which are not used in Tables 4 and 12, and whose CDS = 4 can be used in place of the modulation codes in Table 4 or in Tables 4 and 12. Selecting a modulation code whose CDS = 4 when the end DSV at the end of the preceding modulation code is -2 can improve the bit DSV of the selected modulation code because the bit DSV is sure to take 0 at a particular bit in the selected modulation code.

The modulation codes in Table 5 and Table 13, which are reversal patterns of the codes in Table 4 and Table 12, can be changed in a manner similar to the above, resulting in a similar improvement.

The modulation codes specified to correspond to 8-bit data in Tables 4 and 5 are an example, and so the combination of the modulation codes and the 8-bit code can be altered.

Types of the modulation codes that are allowed to take place according to the end pattern of the preceding modulation code are shown in Table 6.

TABLE 6

10		·	of	Consecutive number of "0" bits at the beginning of beginning modulation code							at t g of	at the	
15		CDS ≥ 0	1 (A)	2 (A)	3 (A)	4 (A)	5 (A)	1 (B)	2 (B)	3 (B)	4 (B)	5 (B)	
	S	CDS <u>≤</u> 0	1 (C)	2 (C)	3 (C)	4 (C)	5 (C)	1 (D)	2 (D)	3 (D)	4 (D)	5 (D)	
20	codes	110	0	0	0	0	0						
	modulation	1100	0	0	0	0	0		0	0	0	0	
25	dula	11000	0	0	0	0			0	0	0	0	
		110000	0	0	0		,		0	0	0	0	
30	preceding	1100000	0	٥					0	0	0	0	
	t I	11000000*	0						0	0	0	0	
35	the	001							0	0	0	0	
40	jo u:	0011		0	0	0	0	0	0	. 0	0	0	
	pattern	00111	·	0	0	0	0	0	0	0	0		
45	End pa	001111		0	0	0	0	0	. 0	0			
	ជ	0011111		0	O	0	0	0	0				
50		001111111*		0	0	0	0	0					

Notes with regard to Table 6:

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[&]quot;o" mark indicates that the modulation codes are allowed.

[&]quot;*" indicates that a modulation code whose CDS ≥ 0 is selected when the end pattern of the preceding modulation code is "...11000000", and that a modulation code whose CDS ≤ 0 is selected when the end pattern

of the preceding modulation code is "...00111111".

For example, when the end pattern of the preceding modulation code is "...11000", and the end DSV of the preceding modulation code is -2, the modulation codes of classes 1(A), 2(A), 3(A), 4(A), 2(B), 3(B), 4(B), and 5(B) in Table 4 can take place as a current modulation code because the current modulation code to be selected must satisfy the requirements that the CDS \ge 0 and the number of consecutive identical bits in the joint portion of the two codes is 2 - 7.

In this case, suppose that the current 8-bit data is "166". Then, one of the two possible modulation codes "00111110011001" (CDS = 2; 2(A)), and "11001111100110" (CDS = 4; 2(B)) shown in Table 4 is selected: the end DSV of the preceding modulation code and the CDS of the current modulation code are added so as to obtain the end DSV of the current modulation code; the modulation code which will give less end DSV is selected, that is, the modulation code "00111110011001" (CDS = 2) is selected. The resultant end DSV is 0 and it indicates that the direct current component is removed.

Fig. 3A shows the CNR (carrier-to-noise ratio) characteristics when a sine wave recorded on magnetic tape is reproduced, Fig. 3B shows the power spectrum at the output terminal of the modulator of the embodiment when random 8-bit data are inputted to the modulator, and Fig. 3C shows the power spectrum of the scrambled NRZ at the output terminal of the scrambled NRZ modulator when random 8-bit data are inputted to the scrambled NRZ modulator. From these figures, it is seen that the power spectrum according to the digital modulation method of the present invention includes no direct current component, and is included within a record-reproduction bandwidth in which the high CNR is obtained. As a result, the record-reproduction characteristics of the magnetic tape and head system can be effectively used. Furthermore, the minimum magnetization transition width of the modulation codes of the digital modulation method according to the present invention is 1.14 times the minimum magnetization transition width of the scrambled NRZ. Consequently, the intercode interference can be reduced.

As described above, the embodiment restricts the number of consecutive identical bits in a stream of modulation codes to 2 - 7. As a result, the minimum magnetization transition width is 1.14T (= (28)T/14), where T is the bit period of the 8-bit data), the maximum magnetization transition width is $4.00T (= (7 \times 8)T/14)$, DR is $1.14 (= (2 \times 8)/14)$, and the ratio of the maximum magnetization transition width to the minimum magnetization transition width is 3.5. Consequently, the bit error rate of the magnetic recording is reduced, and the high-density recording becomes possible. In addition, azimuth recording and high quality over-writing become possible.

Furthermore, the embodiment restricts the absolute value of CDS of the modulation codes equal to or less than 4, allocates up to 4 modulation codes to each 8-bit data according to the DSV at the end of the preceding modulation code and the end pattern of the preceding code, and selects the modulation code the end DSV of which gives the least absolute value. As a result, the absolute value of the end DSV which is calculated at the end of each modulation code is within 2, and the absolute value of the bit DSV which is calculated at each bit of a modulation code is within 7. Thus, the direct current component can be effectively removed, and hence, the transmission of the modulation codes becomes possible by using a rotary transformer that does not pass the direct current component.

[B] SECOND EMBODIMENT

Fig. 6 is a block diagram showing a digital modulation apparatus for carrying out the digital modulation according to the second embodiment of the digital modulation method of the present invention.

In Fig. 6, 8-bit digital data 1 is converted to a 14-bit digital modulation code by an encoder 2. An end pattern judgement portion 3 converts the end pattern of the last 5-bits of the 14-bit digital modulation code into a 4-bit code in Table 21 (although the last 7 bits of the modulation codes are given in Table 21, only the last 5 bits should be considered). A CDS calculation portion 5 computes the CDS of the 14-bit digital modulation code supplled, and converts the resultant CDS into a 3-bit code in Table 20. A DSV calculation portion 4 adds the CDS of the current 14-bit digital modulation code to the DSV at the end of the preceding 14-bit digital modulation code, yielding a new DSV, and converts the new DSV into a 3-bit code shown in Table 20.

A parallel-to-serial converter 8 converts the 14-bit digital modulation code into a serial signal in synchronism with a clock signal 9. A recording portion 10 records the serial modulation signal produced from the parallel-to-serial converter 8 on a recording medium such as magnetic tape or the like.

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TABLE 20

5	CDS,DSV of modulation codes	Corresponding 3-bit codes
10	-6	000
	-4	. 001
15	-2	010
	0	011
20	2	100
	4 .	101
25	6	110
	<u>, </u>	

TABLE 21

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End pattern of the preceding modulation codes	Corresponding 4-bit codes
xxxx110	0000
xxx1100	0001
xx11000	0010
x110000	0011
1100000	0100
xxxx001	1000
xxx0011	1001
xx00111	1010
x001111	1011
0011111	1100
•	

x: Don't care bit

The resultant CDS converted into a 3-bit code shown in Table 20 by the CDS calculation portion 5, is supplied to the DSV calculation portion 4.

The DSV calculation portion 4 converts the resultant DSV into a 3-bit code shown in Table 20, and supplies the code to the encoder 2 via a latch 6. The end pattern judgement portion 3 converts the last five bits into a 4-bit code in Table 21, and supplies the code to the encoder 2 via a latch 7.

Next, the method for selecting a 14-bit digital modulation code corresponding to each inputted 8-bit digital data will be described.

First, the method for selecting up to four 14-bit digital modulation codes for each 8-bit digital data will be described.

The 14-bit digital modulation code is selected by the procedures of

- (a) selecting among the 2¹⁴ 14-bit digital codes, a digital code the numbers of consecutive identical bits in which are 6 or less in the first 7 bits, 2 7 from the second bit to 13th bit, and 5 or less in the last 6 bits, and repeating this selecting procedure,
- (b) selecting among the 14-bit digital codes selected at the procedure (a), a digital code the first bit of which is "0", and the CDS of which has the absolute value equal to or less than 6, and repeating this selecting procedure,
- (c) selecting among the 14-bit digital codes selected at the procedure (a), a digital code the first bit of which

Is "1", and the CDS of which has the absolute value equal to or less than 4, and repeating this selecting procedure,

- (d) selecting among the 14-bit digital codes selected at the procedure (b), a digital code the value of CDS of which is 0, and pairing the selected 14-bit digital code with the reversal code thereof to make the 2 digital codes one group, and repeating this selecting procedure,
- (e) selecting among the 14-bit digital codes selected at the procedure (b), a digital code the value of CDS of which is +2, +4 or +6, selecting among the 14-bit digital codes selected at the procedure (c), a digital code the value of CDS of which is +2 or +4, and combining the two selected 14-bit digital codes with the reversal codes thereof to make the 4 digital codes one group, and repeating this selecting procedure, and (f) selecting 256 groups among the groups formed in the above procedures as the 14-bit digital modulation codes.

Next, the selection procedure of a 14-bit digital modulation code (current modulation code) corresponding to inputted 8-bit data will be described with reference to Fig. 7, which is a flowchart showing the modulation procedure according to the digital modulation method of the present invention.

At step S1, DSV at the end of the preceding modulation code is calculated.

At step S2, the end pattern of the preceding modulation code is judged.

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At step S3, when the DSV < 0, the modulation codes in Table 17 are selected, and when DSV > 0, the modulation codes in Table 18 are selected. On the other hand, when DSV = 0 and the end pattern of the preceding code is any one of "...110", "...00111", "...001111", and "...0011111", the modulation codes in Table 18 are selected. Further, when DSV = 0 and the end pattern of the preceding code is any one of "...1100", "...110000", "...110000", "...110000", and "...001", the modulation codes in Table 17 are selected.

At step S4, a modulation code is selected among the selected codes at step S3 and among the classes 1(A) - 6(D) in Tables 17 and 18, according to the end pattern of the preceding modulation code.

At step S5, is selected a modulation code which gives DSV the absolute value of which is minimum when two or more modulation codes are selected at step S4. In this case, the DSV is obtained by adding the DSV at the end of the preceding modulation code and the CDS of the current modulation code.

At step S6, a modulation code that satisfies the following requirements is selected when two or more modulation codes selected at step S5 have the same minimum DSV.

When DSV < 0 at the end of the preceding modulation code, a modulation code whose first bit is "1" is selected.

When DSV > 0 at the end of the preceding modulation code, a modulation code whose first bit is "0" is selected.

When DSV = 0 at the end of the preceding modulation code, a modulation code whose first bit is opposite to the last bit of the preceding modulation code.

The 14-bit digital modulation code thus selected is fed to the parallel-to-serial converter 8. The modulation code entered the parallel-to-serial converter 8 is serially read out in synchronism with the clock 9, and is fed to the recording portion 10, where the 14-bit digital modulation code is recorded on the record medium such as magnetic tape or the like.

On the other hand, the 14-bit digital modulation code selected by the encoder 2 is supplied to the DSV calculation portion 4, and to the modulation code end pattern judgement portion 3. The DSV calculation portion 4 adds the CDS of the current modulation code to the DSV at the end of the preceding modulation code to obtain a new DSV. The new DSV is converted into a 3-bit code according to Table 20, and is supplied to the encoder 2 through latch 6. The end pattern judgement portion 3 converts the last 5 bits of the 14-bit modulation code into a 4-bit code according to Table 21, and supplies the 4-bit code to the encoder 2 through latch 7.

The above procedure is repeated for every 8-bit input data. Thus, a 14-bit digital modulation code train is obtained, in which the number of consecutive identical bits is restricted to 2 - 7, and the absolute value of the DSV is restricted equal to or less than 8.

Next, the 14-bit digital modulation code produced from the encoder 2 in Fig. 6 will be described.

The 14-bit digital modulation code converted from the 8-bit code satisfies the following requirements.

- (1) The number of consecutive identical bits in the first 7 bits is equal to or less than 6.
- (2) The number of consecutive identical bits included from the second bit to the 13th bit is 2 7.
- (3) The number of consecutive identical bits included in the last 6 bits is equal to or less than 5.
- (4) The absolute value of CDS of the modulation code is equal to or less than 6.

The end patterns of the modulation codes that satisfy the above requirements (1) to (4) are summed up as the following 10 items (A) - (K).

	(A)	110
	(B)	1100
5	(C)	11000
	(D)	110000
	(E)	··· ··· 1100000
	(F)	001
10	(G)	0011
	(H)	
	(J)	···· ··· 001111
15	(K)	0011111

The beginning of the modulation code succeeding to the modulation codes (A) - (K) is one of the following items.

First, the beginning of the modulation code succeeding to the modulation code (A) is one of the following five items (A1) - (A6).

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Second, the beginning of the modulation code succeeding to the modulation code (B) is one of the following ten items (B1) - (B10).

(B1) 011 (B2) 0011... 40 (B3)00011 (B4)000011 (B5)0000011 45 (B6)1100... (B7) 11100 (B8) 111100 (B9) 1111100 50 (B10) 11111100

The beginning of the modulation code succeeding to the modulation code (C) is one of the following nine items (C1) - (C9).

	(C1)	011
•	(C2)	0011
5	(C3)	00011
	(C4)	000011
	(C5)	1100
	(C6)	11100
10	(C7)	111100
	(C8)	1111100
	(C9)	11111100

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The beginning of the modulation code succeeding to the modulation code (D) is one of the following eight items (D1) - (D8).

```
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                        (D1)
                                011 ... ... ...
                        (D2)
                                0011... ... ...
                        (D3)
                                00011 ... ...
                                1100... ... ...
                        (D4)
25
                        (D5)
                                11100 ... ...
                        (D6)
                                111100 ... ...
                        (D7)
                                1111100
30
                        (D8)
                                11111100 ......
```

The beginning of the modulation code succeeding to the modulation code (E) is one of the following seven items (E1) - (E7).

```
(E1)
                                011 ... ... ...
                        (E2)
                                0011... ... ...
                        (E3)
                                1100... ... ...
40
                        (E4)
                                11100 ... ...
                        (E5)
                                111100 ... ...
                        (E6)
                                1111100
45
                        (E7)
                                11111100 ......
```

The beginning of the modulation code succeeding to the modulation code (F) is one of the reversal patterns of the modulation codes (A1) - (A6).

The beginning of the modulation code succeeding to the modulation code (G) is one of the reversal patterns of the modulation codes (B1) - (B10).

The beginning of the modulation code succeeding to the modulation code (H) is one of the reversal patterns of the modulation codes (C1) - (C9).

The beginning of the modulation code succeeding to the modulation code (J) is one of the reversal patterns of the modulation codes (D1) - (D8).

The beginning of the modulation code succeeding to the modulation code (K) is one of the reversal patterns of the modulation codes (E1) - (E7).

The numbers of the modulation codes that satisfy the requirements (1) - (4) are shown in Tables 14 and

15.

TABLE 14

	Beginning pattern of	The number of possible modulation codes									
10	modulation codes		CDS Value								
15		-6	-4	-2	0	2	4	6	Total	CDS <u>≤</u> 0	CDS ≥ 0
15	00000011	5	6	5	1	0	0	0	17	17	1
20	0000011	6	9	8	6	0	0	0	29	29	6
20	000011	6	12	14	10	5	0	0	47	42	15
25	00011	7	14	21	20	10	4	0	76	62	34
	0011	5	17	28	33	25	10	3	121	83	71
30	011	4	15	37	49	46	31	8	190	105	134
	Total	33	73	113	119	86	45	11	480	338	261
		·									

TABLE 15

5	Beginning pattern of	The number of possible modulation codes									
10	modulation codes		CDS Value								
		-6	-4	-2	0	2	4	6	Total	CDS <u>≤</u> 0	CDS ≥ 0
15	11111100	0	0	0	1	5	6	5	17	1	17
	1111100	0	0	0	6	8	9	6	29	6	29
20	111100	0	0	5	10	14	12	6	47	15	42
	11100	0	4	10	20	21	14	7	76	34	62
25	1100	3	10	25	33	28	17	5	121	71	83
	100	. 8	31	46	49	37	15	4	190	134	105
30	Total	11	45	86	119	113	73	33	480	261	338

More than 256 modulation codes whose CDS ≥ 0, and more than 256 modulation codes whose CDS ≤ 0 are necessary, which follow one of the modulation codes (A) - (K). In addition, the converted modulation code must correspond to one 8-bit data to avoid transmission error.

The number of modulation codes that can succeed one of the modulation codes (A) - (K) is shown in Table 16.

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TABLE 16

5	End pattern of modulation codes	-	The number of possible successive modulation codes									
10	55255				CDS	Val	ue	,				
:		-6	-4	-2	0	2	4	6	Total	CDS ≤ 0	CDS ≥ 0	
15	110	33	73	113	119	86	45	11	480	338	261	
	1100	31	81	148	188	162	103	40	753	448	493	
20	11000	25	72	140	182	162	103	40	724	419	487	
05	110000	19	60	126	172	157	103	40	677	377	472	
25	1100000	12	46	105	152	147	99	40	601	315	438	
30	001	11	45	86	119	113	73	33	480	261	338	
	0011	40	103	162	188	148	· 81	31	753	493	448	
35	00111	40	103	162	182	140	72	25	724	487	419	
	001111	40	103	157	172	126	60	19	677	472	377	
40	0011111	40	99	147	157	105	46	12	601	438	315	

Fig. 8 shows the number of modulation codes of respective classes when CDS \ge 0, and Fig. 9 shows the number of modulation code of respective classes when CDS \le 0.

Tables 17 and 18 show the correspondence between the 8-bit data and the modulation codes: Table 17 shows the correspondence when CDS \ge 0; and Table 18 shows the correspondence when CDS \le 0.

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Table 17 (CDS \geq 0)

5	Class	8-bit data	Modulation codes beginning with "O"	CDS	Class		Modulation codes beginning with "1"	CDS
10		0 1 2 3 4 5 6 7	01111110000001 01111100110000 01111100011000 01111100001100 011111000000	0 0 0 0 0 0		0 1 2 3 4 6 8 7	10000001111110 10000011001111 10000011100111 10000011110011 10000011111001 100001100011111 100001100011111	00000000
15		9 10 11 12 13 14 15	01111000110001 01111000011100 01111000011001 01111000001110 011110011110000 01110011100001 01110011001100			9 10 11 12 13 14 15	10000111001110 10000111100011 10000111100110 10000111110001 100001100001111 10001100011110 100011000110011	0000000
20		17 18 19 20 21 22	01110011000110 01110011000011 01110001110001 01110001100011 0111000110011 01110000111100	000000		17 18 19 20 21 22	10001100111001 10001100111100 10001110001110 10001110011100 10001110011100 10001111000011	000000
25	1 (A)	24 25 26 27 28 29 30	01110000111001 01110000110011 0111000001111 011000111110000 011001111100001 01100111100011001100	000000	1 (B)	24 25 26 27 28 29 30	10001111000110 10001111001100 10001111100001 1000111111	000000
30		31 32 33 34 35 36	01100111000110 011001110011100 01100110	0 0 0 0 0		31 32 33 34 35 36	10011000111001 10011000111100 100110011	000000
35		38 39 40 41 42 43 44	01100011110001 01100011100110 01100011100011 01100011000111 01100001111100 01100001111001	0 0 0 0 0		38 39 40 41 42 43	10011100001110 10011100011001 10011100011000 10011100111000 1001111000011 10011110000110	000000
40		48 46 47 48 49 50	01100001110011 01100001100111 0110000011111 01101000011111 0111111	0 0 0 2 2 2 2		45 46 47 48 49 50 51	10011110001100 100111110011000 1001111100000 100111111	0 0 0 2 2 2
45		52 53 54 55 56 57 58	0111110000110 01111100111000 01111100111000 0111110011100 01111100011100 01111100001110	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		52 53 54 55 56 57 58	10000111100111 1000011111001 10000111111	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
50		59 60 61 62 63 64 65 66	0111100000111 011110011110001 011110011100011 01111001100011 01111000111100 01111000111001	2 2 2 2 2 2 2 2		59 60 61 62 63 64 65 66	10001110011110 10001111001110 10001111100110 10001111100110 1000111111	2 2 2 2 2 2 2 2 2 2

Table 17 (CDS \geq 0)

5	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class		Modulation codes beginning with "1"	CDS
10		67 68 69 70 71 72 73	01111000011110 01111000001111 01110011110001 01110011100110 01110011001110 01110011001110	2222222		67 68 69 70 71 72 73	10011000111110 10011001100111 100110011	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
15		75 76 77 78 79 80 81 82 83	0111000111100 0111000111001 0111000110011 0111000011110 01110000011111 01100111111	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1 (B)	75 76 77 78 79 80 81 82 83	1001110011100 10011100111100 10011110000111 10011110011100 100111110011100 1001111100011 10011111001100 10011111001100	2 2 2 2 2 2 2 2 2 2 2
20	1 (A)	84 85 86 87 88	01100111100011 011001110001110 0110011100011110 011001100011111	2 2 2 2 2		85 86 87 88	10011111110000 10011111000111 110000111111	4 4
25		90 91 92 93 94 95	01100011111100 01100011111001 01100011100111 01100011001111 01100011011	2 2 2 2 4 4		90 91 92 93 94 95	11000111100111 11000111110011 11000111111	444444
30		96 97 98 99 100 101 102 103	0111111000011 01111110011100 01111110011100 0111111	4 4 4 4 4 4 4 4		97 98 99 100 101 102 103 104	11001110011110 11001111000111 11001111001110 11001111100011 110000111111	4 4 4 2 2 2 2 2 3
35		105 106 107 108 109 110	0111100011110 0111100001111 01111001111001 01111001110011 01111001100111	44444	2 (B)	105 106 107 108 109 110	11000011111001 11000011111100 11000110001111 110001110011110 11000111001110 1100011100011	2 2 2 2 2 2 2
40		111 112 113 114 115 116 117	0111000011111 01110011111100 01110011110011 0111001110011 01110011001111	44444		112 113 114 115 116 117 118	11000111100110 11000111110001 11000111111	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
45		119 120 121 122 123 124	01100111111100 0110011111001 01100111110011 01100111001111 011001110011111 011000111111	4		119 120 121 122 123 124 125 126	11001110001110 11001110001110 11001110011100 1100111100011 11001111000110 1100111100110	2 2 2 2 2 2
50	2 (A)	126 127 128 129 130 131 132 133	00111111100000 00111111001100 0011111001100	6 6 0 0		127 128 129 130 131 132	11001111100001 11001111110000 11000000011111 11000000	2 2 0 0 0

Table 17 (CDS \geq 0)

5	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class	8-bit data	Modulation codes beginning with "1"	CDS
10		134 135 136 137 138 139 140 141	00111110000011 00111100111000 001111001110001 00111100011100 00111100001110 00111100001111 00111100001111 001111001111000	00000000	•	134 135 136 137 138 139 140 141	11000001111100 11000011000111 110000110011-10 11000011100011 1100001110001 1100001111000 11000110000111	000000000
15		143 144 145 146 147 148 149	00111001100110 00111001110001 00111000111001 00111000111001 00111000011110 0011100001111	000000000000000000000000000000000000000	2 (B)	143 144 145 146 147 148 149	11000110011001 1100011000011 11000111000110 110001110001 1100011110000 11001100000111	000000
20		151 152 153 154 158 156	00110011110001 00110011100110 00110011100011 00110011000111 00110001111100 00110001111001	000000		151 152 153 154 155 156 156	11001100001110 11001100011001 11001100011000 110011001110000 11001110000011 110011100000110	000000
25	2 (A)	158 159 160 161 162 163 164	00110001110011 00110001100111 0011000011111 00111111	0 0 0 2 2 2 2		158 169 160 161 162 163 164	11001110001100 11001110011000 1100111100000 11001111100110 1100111111	0 0 0 4 4 4 4
30		165 166 167 168 169 170	0011111000011 0011110011100 001111001110 0011110001110 00111100111100 00111100111001	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	·	168 166 167 168 169 170 171	11100001111110 11100011001111 11100011110011 11100011111001 11100110001111	*****
35		172 173 174 175 176 177 178	0011100110011 001110001111 00111000111100 00111001111001 0011100110011 0011100111111	2 2 2 2 2 2		173 174 178 176 177 178 179	11100111000111 11100111001110 1110011110011 1110011110011 11100111111	4 4 4 4 4 2
40		180 181 182 183 184 185	00111000011111 00110011111100 001100111110011 001100111100111 001100111001111	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 (B)	180 181 182 183 184 185	11100000111110 11100001100111 1110000111001 11100001111001 11100011000111	2 2 2 2 2 2 2
45		187 188 189 190 191	00111111100116 00111111100011 00111111001110 0011111001111 00111110001111			187 188 189 190 191 192	1110001110001Y 11100011100110 11100011110001 1110001111000 11100110000111 11100110001110	2 2 2 2 2 2 2
50		193 194 195 196 197 198	0011110001111 00111001111111 001100111111	1 4 0 4 0 4 1 5 1 6		194 195 196 197 198 199	11100110011100 11100111000011 11100111000110 11100111001100 11100111100000	2 2 2 2 2

Table 17 (CDS \geq 0)

5	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class	8-bit data	Modulation codes beginning with "1"	CDS	
10	-	200 201 202 203 204 205 206 207 208 209	0001111110000 0001111100001 00011111001100 00011111000110 00011110011100 00011110011100 00011110001110 00011110001110	000000000	. (2)	200 201 202 203 204 205 206 207 208	1110000001111 1110000011100 1110000110011	000000000	
15	3 (A)	210 211 212 213 214 215 216 217 218	00011100111001 000111001110011 00011100011110 000111000111100 00011001111001 00011001110011 000110011100111		3 (8)	210 211 212 213 214 215 216 217 218	11100011000110 111000110001100 111000111100001 111000110000011 111001100	00000000	
20	v		219 220 221 222 223 224	00011000011111 00011111110001 00011111100110 000111111	2 2 2 2 2		219 220 221 223 223 224	1110011100000 11110000001111 1111000011001 11110000111001 11110000111001	0 2 2 2 2 2 2
25		228 226 227 228 229 230 231 232	00011110011110 00011110001111 00011100111110 00011100111111	2 2 2 4 4 4	4 (B)	225 226 227 228 229 230 231 232	11110001100011 11110001100110 11110001110001 1111000111000 11110011000011 11110011000110 11110011100001	2 2 2 2 2 2 2 2 2 2 2 2	
30		233 234 235 236 237 238 239	00011110011111 0000111111000 0000111110010 0000111100011 00001111001110 00001111000111	0 0 0 0		233 234 235 236 237 238 239	11110011110000 11110000000111 1111000001100 11110000011000 11110000111000 11110000110001	20000000	
35	4 (A)	240 · 241 242 243 244	00001110011110 00001110001111 00001100011111 0000111111	0 0 0	_	240 241 242 243 344	11110001100001 11110001110000 111100111000001 111100111000001	0 0 0	
40		245 246 247 248 249	00001111110011 00001111100111 00001111001111 0000111111	2 2 2 2 0	5 (B)	245 246 247 248 249	11111000011100 11111000110001 11111000111000 11111001110000 11111000000	2 2 2 0	
	5 (A)	250 251 252 253 254	00000111111001 00000111110011 00000111100111 00000111001111	0000		250 251 252 283 - 284	11111000000110 11111000001100 1111100011000 1111100110000	00000	
45	6 (A)	255	00000011111110	Ŏ	8 (B)	255	11111100000001	0	

Table 18 (CDS \leq 0)

,	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class	8-bit data	Modulation codes beginning with "1"	CDS
10		0 1 2 3 4 5 6 7 8 9	01111110000001 01111100110000 01111100011000 01111100001100 01111100000110 011111000000	000000000		0 1 2 3 4 5 6 7 8 9	10000001111110 10000011001111 10000011100111 10000011110011 10000011111001 10000110001111 10000110001111 100001100011110	00000000
15		10 11 12 13 14 15 16	01111000011100 01111000001100 01111000000	0000000		10 11 12 13 14 15 16	10000111100011 100001111100110 10000111111	0000000
20		18 19 20 21 22 23 24 25	01110011000011 01110001111000 01110001110011 01110001100110 0111000111100 01110000111100	0 0 0 0		18 19 20 21 22 23	10001100111100 10001110000111 10001110001110 10001110011001 1000111000111 10001111000011 10001111000110	0000000
25	1 (C)	26 27 28 29 30 31 32	01110000110011 01110000011110 0111000000	000000	1 (D)	25 26 27 28 29 30 31 32	10001111100001 100011111110000 10011000001111 10011000011110 10011000111001 10011000111001	0 0 0 0 0
30		33 34 35 36 37 38 39	01100110011001 01100110011001 011001100	0000000		33 34 35 36 37 38 39 40	1001100110011 10011001100110 1001100111000 1001100111100 1001110000111 10011100011001	000000000000000000000000000000000000000
35		41 42 43 44 45 46	01100011001110 01100011000111 01100001111001 01100001110011 01100001100111	0000000		41 42 43 44 45 46 47	10011100110001 10011100111000 1001111000011 10011110001100 10011110011000 10011111000001	0 0 0 0 0
40		48 49 50 51 52 53 54	01100000011111 01111100000001 01111001100000 0111100011000 01111000001100	0 -2 -2 -2 -2 -2 -2 -2		48 49 50 51 52 53 54 55	1001111110000 1000000111110 1000000110011 1000000	-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -
45		56 57 58 59 60 61 62	0111001110000 0111001100001 01110001110000 0111000111000 01110000110001 01110000110001	-2 -2 -2 -2 -2 -2		56 57 58 59 60 61 62	100001110011 10000011100110 10000011110001 1000011111000 10000110001110 10000110001110	-2 -2 -2 -2 -2 -2 -2
50 .		63 64 65 66	01110000001110	-2 -2 -2 -2		63 64 65 66	10000110011100 10000111000011 10000111000110 10000111001100	-2 -2 -2 -2

Table 18 (CDS \leq 0)

_	Class	8-bit data	Modulation codes	CDS	Class		Modulation codes beginning	CDS
5			with "0"				with "1"	
10		67 68 69 70 71 72 73 74 75	0110011100001 01100110011000 01100110001100 01100110000110 01100110000011 0110001110000 01100011001100 01100011001100	222222222		67 68 69 70 71 72 73 74 75	10000111100001 10000111110000 10001100000111 10001100001110 100011000110001 100011000110001 10001100011000 1000111000011	-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -
15	1 (C)	77 78 79 80 81 82 83 84	0110000111000 0110000110001 01100001100011 0110000110001 01100000111001 0110000011001 011000001110	-2222222		77 78 79 80 81 82 63 84	10001110001100 100011110011000 1000111100000 1000111100000 10011000000	-2 -2 -2 -2 -2 -2 -2 -2
20		86 87 88 89 90 91	01100000111000 00111100000001 0011100110000 0011100011000 00111000001100 00111000001100	-4 -4 -4 -4 -4	1 (0)	86 87 88 89 90 91	10011000111000 10011001100001 100110011	-2 -2 -2 -2 -2 -2 -2
25		93 94 95 96 97 98	00111000000011 00110011100000 001100110	-4 -4 -4 -4 -4		93 94 95 96 97 98	10011100110000 10011110000001 10000000110011 1000000	-2 -2 -4 -4 -4 -4
30	2 (C)	100 101 102 103 104 105 106	00110000011100 0011111000001 0011110011000 0011110001100 0011110000110 0011110000011	-4 -2 -2 -2 -2 -2 -2		100 101 102 103 104 105 106	10000011110001 100000011110001 10000011000011 10000011000110 10000011100100	-4-4-4-4-4
35		107 108 109 110 111 112 113 114	00111001110000 00111001110001 001110001110001 00111000011100 00111000011100 00111000001110	-2 -2 -2 -2 -2 -2 -2 -2		107 108 109 110 111 112 113	10000110000011 10000110000110 10000110001100 10000110011000 1000011100000 100011000000	-4 -4 -4 -4 -4
40		115 116 117 118 119 120 121	00110011110000 00110011100001 001100110	-2 -2 -2 -2 -2 -2 -2 -2		115 116 117 118 119 120	10001100001100 10001100011000 10001100110000 1000111000000	-6 -6 -6 -6 -6
45		122 123 124 125 126 127	00110001100110 00110001100011 00110000111001 00110000111001 0011000011110	-2 -2 -2 -2 -2 -2 -2 -2		122 123 124 125 126 127 128	10011000011000 10011000110000 100110011	-4 -4 -6 -6
50		129 130 131 132	00110000001111 00111111100000 0011111100100	0 0	2 (D)	129 130 131 132	10000011100000 11000000011111 110000001100111 11000001100111	0 0

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Table 18 (CDS \leq 0)

	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class		Modulation codes beginning with "1"	CDS
5		133 134 135 136 137	00111110000110 00111110000011 001111001111000 00111100110001	00000		133 134 135 136 137	11000001111001 11000001111100 11000011000111 11000011001110 11000011100011	0 0 0
10		138 139 140 141 142	00111100011001 00111100001110 00111100000111 001111001111000	00000	·	138 139 140 141 142	11000011100110 11000011110001 11000011111000 11000110000111	0 0
15	2 (C)	143 144 145 146 147 148 149 150	00111001100110 00111001100011 0011100011100 0011100011001 0011100011001 00111000001111 0011000001111	0000000		143 144 145 146 147 148 149	11000110011001 11000110011100 11000111000011 11000111000110 11000111100001 110001111100001 11000111110000	000000
20		151 152 153 154 155 156 157	00110011110001 00110011100110 00110011100011 00110011001111 00110001111100 00110001111100	00000	2 (D)	151 152 153 154 155 156 156	11001100001110 11001100011001 11001100011100 11001100110001 11001110000011 11001110000011	000000
25		158 159 160 161 162 163 164	00110001110011 00110001100111 00110000111110 0011000001101 0011000000	0 0 0 -4 -4 -4	2 (0)	158 159 160 161 162 163 164	11001110001100 11001110011000 11001111000001 11001111100000 11000000	0 0 0 -2 -2 -2
30		165 166 167 168 169 170 171	00011110000001 00011100011000 00011100001100 00011100000110 000111000000	-4 -4 -4 -4 -4		165 166 167 168 169 170 171	11000000111100 11000001100011 1100000110001 1100000111000 11000011000011 11000011000110	-2 -2 -2 -2 -2 -2 -2 -2 -2
35	3 (C)	173 174 175 176 177 178	00011001100001 00011000111000 00011000111000 00011000011100 00011000001110 00011000000	-4 -4 -4 -4 -4 -4		173 174 175 176 177 178	11000011100001 11000011110000 11000110000011 11000110000110 11000110001100 11000110011000	-2 -2 -2 -2 -2 -2 -2
40		180 181 182 183 184 185	00011111000001 00011110011000 0001111000110 00011110000110 00011110000011	-22-22		180 181 182 183 184 185	1100111100000 11001100000011 11001100000110 11001100001100 11001100011000 110011100100	-2 -2 -2 -2 -2 -2
45		187 188 189 190 191 192	00011100110001 00011100011100 00011100001110 0001110000111 00011001111000 00011001111000	-2 -2 -2 -2 -2 -2 -2		187 188 189 190 191 191	1100000011001 1100000011100 110000011000 1100000111000 1100001110000	
50		193 194 195 196 197 198 199	00011001100110 00011001100011 000110001111001 000110001110011 000110000111110	-2 -2 -2 -2 -2 -2 -2		193 194 195 196 197 198 199	11000011000001 11000011000000 1100011000000	-4 -4 -4 -6 -6

Table 18 (CDS \leq 0)

5	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class	8-bit data	Modulation codes beginning with "1"	CDS
10	3 (C)	200 201 202 203 204 205 206 207 208 209	00011111110000 0001111100001 00011111001100 00011111000110 00011111001110 00011110011100 00011110011101 00011110001110	0000000000		200 201 202 203 204 205 206 207 208 209	11100000001111 11100000011110 11100000110011 11100000111001 11100001100011 11100001100011 1110000110001	0000000000
15		210 211 212 213 214 215 216 217 218 219	00011100111001 00011100110011 00011100011110 0001100001111 00011001111001 00011001110011 00011001110111 00011000111111	000000000000000000000000000000000000000	3 (D)	210 211 212 213 214 215 216 217 218 219	11100011000110 11100011000101 11100011100001 1110001110000011 11100110000110 11100110001100 11100110001000 1110011100000	000000000
20		220 221 222 223 224 225	0000111110000 00001111100001 0000111100110 0000111100011 00001111000011	-2 -2 -2 -2 -2		220 221 222 223 224 225	11100000001110 11100000011001 11100000011000 11100000110001 1110000111000	-2 -2 -2 -2 -2
25	4 (C)	226 227 228 229 230 231 231	00001110011001 0000111000111 0000111000111 00001100111001 00001100110011	-2 -2 -2 -2 -2 -2 -2		226 227 228 229 230 231 232	11100001110000 11100011000001 11100011000001 1110011000001100 1110000011000	-2 -2 -2 -4 -4 -4
30		233 234 235 236 237 238 239	00001100001111 00001111111000 0000111111	0 0 0 0		233 234 235 236 237 238 239	11100001100000 111100000001110 1111000001100 1111000001100 1111000011000 1111000011000	-4 0 0 0 0
35		240 241 242 243	00001110011110 00001110001111 00001100111110 00001100011111	0 0 0	4 (D)	240 241 242 243	11110001100001 11110001110000 111100111000001 11110011100000	0 0 0 0 -2
	5 (C)	245 246 247 248	00000111111000 00000111100011 00000111000111 00000111000111	-2 -2 -2 -2 -2		244 245 246 247 248	11110000000110 11110000001100 1111000011000 1111000110000	-2 -2 -2 -2
40		249 250 251 252 253 254	00000111111100 0000011111001 00000111110011 00000111100111 00000111001111	00000	5 (D)	249 250 251 252 253 254	11111000000011 1111100000110 11111100001100 111111	00000
	5 (C)	255	00000011111110	0	6 (D)	255	11111100000001	ő
45				·····				

Types of the modulation codes that are allowed to take place according to the end pattern of the preceding modulation code are shown in Table 19.

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TABLE 19

5 j	- 1		1											—
10			of	Consecutive number of "0" bits at the beginning of modulation code					Consecutive number of "l" bits at the beginning of modulation code					
10	8.8	CDS <u>≥</u> 0	1 (A)	2 (A)	3 (A)	4 (A)	5 (A)	6 (A)	1 (B)	2 (B)	3 (B)	4 (B)	5 (B)	6 (B)
15	n codes	CDS <u>≤</u> 0	1 (C)	2 (C)	3 (C)	4 (C)	5 (C)	6 (C)	1 (D)	2 (D)	3 (D)	4 (D)	5 (D)	6 (D)
20	lation	110	0	0	0	0	0	0				-		
20	modulat	1100	0	0	0	0	0			0	0	0	0	0
25		11000	0	0	0	0				0	0	0	0	0
-30	preceding	110000	0	0	0					0	0	0	0	0
30	the pr	1100000	0	0						0	0	0	0	0
	of th	001							0	0	o	0	٥	0
35		0011		0	0	0	0	0	0	0	0	0	0	
	pattern	00111		0	o	0	0	0	0	0	0	0		
40	End	001111		0	0	0	0	0	0	0	0			
		0011111		0	0	0	0	0	0	0				
45														

"o" mark indicates that the modulation codes are allowed.

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For example, when the end pattern of the preceding modulation code is "...11000", and the end DSV of the preceding modulation code is -4, the modulation codes of classes 1(A), 2(A), 3(A), 4(A), 2(B), 3(B), 4(B), 5(B) and (6B) in Table 17 can take place as a current modulation code.

In this case, suppose that the current 8-bit data is "166". Then, one of the two possible modulation codes "00111110011100" (CDS = 2; 2(A)), and "11100011001111" (CDS = 4; 2(B)) is selected: the end DSV at the end of the preceding modulation code and the CDS of the current modulation code are added so as to obtain the end DSV at the end of the current modulation code; the modulation code which will give less DSV is selected, that is, the modulation code "11100011001111" (CDS = 4) is selected. The resultant DSV is 0 and it indicates that the direct current component is removed.

Fig. 3A shows the CNR (carrier-to-noise ratio) characteristics when a sine wave recorded on magnetic tape is reproduced, Fig. 3B shows the power spectrum at the output terminal of the modulator of the embodiment when random 8-bit data are inputted to the modulator, and Fig. 3C shows the power spectrum of the scrambled NRZ at the output terminal of the scrambled NRZ modulator when random 8-bit data are inputted to the scrambled NRZ modulator.

As described above, the embodiment restricts the number of consecutive identical bits in a stream of modulation codes to 2-7. As a result, the minimum magnetization transition width is 1.14T (= $(2 \times 8)T/14$, where T is the bit period of the 8-bit data), the maximum magnetization transition width is 4.00T (= $(7 \times 8)T/14$), DR is 1.14 (= $(2 \times 8)/14$), and the ratio of the maximum magnetization transition width to the minimum magnetization transition width is 3.5. Consequently, the bit error rate of the magnetic recording is reduced, and the high-density recording becomes possible. In addition, azimuth recording and high quality over-writing become possible.

Furthermore, the embodiment restricts the absolute value of CDS of the modulation codes equal to or less than 6, allocates up to 4 modulation codes to each 8-bit data according to the DSV at the end of the preceding modulation code and the end pattern of the preceding code, and selects the modulation code the DSV of which gives the least absolute value. As a result, the maximum value of the absolute value of the end DSV can be restricted within 4. Thus, the direct current component can be effectively removed, and hence, the transmission of the modulation codes becomes possible by using a rotary transformer that does not pass the direct current component.

Although specific embodiments of a digital modulation method in accordance with the present invention have been disclosed, it is not intended that the invention be restricted to either the specific configurations or the uses disclosed herein. Modifications may be made in a manner obvious to those skilled in the art. Accordingly, it is intended that the invention be limited only by the scope of the appended claims.

Claims

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- A digital modulation method for converting 8-bit digital data into 14-bit digital modulation codes, said digital
 modulation method characterized by comprising:
 - step 1 for selecting up to four 14-bit digital modulation codes for each 8-bit digital data, said 14-bit digital modulation code is selected by the procedures of
 - (a) selecting among the 2¹⁴ 14-bit digital codes, a digital code the numbers of consecutive identical bits in which are 5 or less in the first 6 bits, 2 7 from the second bit to 13th bit, and 6 or less in the last 7 bits, the absolute value of CDS (code word digital sum) of the selected digital code being 4 or less, and repeating this selecting procedure,
 - (b) selecting among the selected 14-bit digital codes at the procedure (a), a digital code the first bit of which is "0", and the value of CDS of which is 0, and pairing the selected 14-bit digital code with the reversal code thereof to make the 2 digital codes one group, or selecting among the selected 14-bit digital codes at the procedure (a), a digital code the first bit of which is "1", and the value of CDS of which is +2 or +4, combining the selected 14-bit digital codes with the reversal codes thereof, and further combining the two 14-bit digital codes with a pair of 14-bit digital codes selected at the above procedure to make the 4 digital codes one group, and repeating this selecting procedure,
 - (c) selecting among the selected 14-bit digital codes at the procedure (a), a digital code the first bit of which is "0", and the value of CDS of which is +2, and another digital code the first bit of which is "1", and the value of CDS of which is +2 or +4, and combining the two selected 14-bit digital codes with the reversal codes thereof to make the 4 digital codes one group, and repeating this selecting procedure,
 - (d) selecting among the selected 14-bit digital codes at the procedure (a), a digital code the first bit of which is "0", and the value of CDS of which is +4, and another digital code the first bit of which is "1", and the value of CDS of which is +2, and combining the two selected 14-bit digital codes with the reversal codes thereof to make the 4 digital codes one group, and repeating this selecting procedure, and
 - (e) selecting 256 groups among the groups formed in the above procedures as the 14-bit digital modulation codes;
 - step 2 for selecting one group of 14-bit digital modulation codes among the 256 groups of the 14-bit digital modulation codes, the selected group corresponding to inputted 8-bit digital data; step 3 for further selecting one or more 14-bit digital modulation codes in the selected group at step 2, each of the 14-bit digital modulation codes satisfying the requirement that the number of consecutive

Identical bits at the joint portion of the preceding 14-bit digital modulation code already selected and the 14-bit digital modulation code to be selected is 2 - 7; and

step 4 for further selecting one 14-bit digital modulation code among the selected modulation codes at step 3 so that said one 14-bit digital modulation code satisfies the requirement that the absolute value of bit DSV (Digital Sum Value) for each bit in the modulation code is equal to or less than 7.

A digital modulation method as claimed in claim 1, characterized in that said step 3 comprises the procedures of:

selecting any one of the digital modulation codes the first bits of which are "01", "001", "0001", "00001", and "000001" when the preceding digital modulation code that has already been selected terminates with "10";

selecting any one of the digital modulation codes the first bits of which are "10", "1110", "1110", "11110", and "111110" when the preceding digital modulation code that has already been selected terminates with "01":

selecting any one of the digital modulation codes the first bits of which are "110", "1110", "11110", "111110", "01", "0001", "00001", "00001", and "000001" when the preceding digital modulation code that has already been selected terminates with "100";

selecting any one of the digital modulation codes the first bits of which are "001", "0001", "00001", "000001", "10", "110", "1110", "11110", and "111110" when the preceding digital modulation code that has already been selected terminates with "011";

selecting any one of the digital modulation codes the first bits of which are "110", "1110", "11110", "111110", "01", "001", "0001", and "00001" when the preceding digital modulation code that has already been selected terminates with "1000";

selecting any one of the digital modulation codes the first bits of which are "001", "0001", "00001", "000001", "10", "110", "1110", and "11110" when the preceding digital modulation code that has already been selected terminates with "0111";

selecting any one of the digital modulation codes the first bits of which are "110", "1110", "11110", "111110", "01", "001", and "0001" when the preceding digital modulation code that has already been selected terminates with "10000";

selecting any one of the digital modulation codes the first bits of which are "001", "0001", "00001", "000001", "10", "110", and "1110" when the preceding digital modulation code that has already been selected terminates with "01111":

selecting any one of the digital modulation codes the first bits of which are "110", "1110", "11110", "111110", "01", and "001" when the preceding digital modulation code that has already been selected terminates with "100000":

selecting any one of the digital modulation codes the first bits of which are "001", "0001", "00001", "000001", "10", and "110" when the preceding digital modulation code that has already been selected terminates with "011111";

selecting any one of the digital modulation codes the first bits of which are "110", "1110", "11110", "111110", and "01" when the preceding digital modulation code that has already been selected terminates with "1000000"; and

selecting any one of the digital modulation codes the first bits of which are "001", "0001", "00001", "000001", and "10" when the preceding digital modulation code that has already been selected terminates with "0111111";

A digital modulation method as claimed in claim 1, characterized in that said step 4 comprises the procedures of:

selecting any one of the digital modulation codes the CDS of which are 0, -2 and -4, when the DSV at the end of the preceding 14-bit digital modulation code that has already been selected is +2;

selecting any one of the digital modulation codes the CDS of which are +2, 0 and -2, when the DSV at the end of the preceding 14-bit digital modulation code that has already been selected is 0; and

selecting any one of the digital modulation codes the CDS of which are +4, +2, and 0 when the DSV at the end of the preceding 14-bit digital modulation code that has already been selected is -2;

55 A digital modulation method as claimed in claim 1, characterized in that said digital modulation codes obtained at step 1 are the codes described in the following Tables 4 and 5, or the codes obtained by substituting a part of Table 4 by the following Table 12, or the codes obtained by substituting a part of Table 5 by the following Table 13.

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Table 4 (CDS \geq 0)

	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class	8-bit data	Modulation codes beginning with "1"	CDS
5		0	01111110000001	00		0	10000001111110	0
		2 3 4 5 6	01111100011000 01111100001100 01111100000140 01111100000011	0000		2 3 4 5	10000011100111 10000011110011 10000011111001 100000111111	0
10		7	01111001110000 01111001100001 01111000111000	000		6 7 · 8	10000110001111 10000110011110 10000111000111	000
15		9 10 11 12	01111000110001 01111000011100 01111000011001 01111000001110	0000		9 10 11 12	10000111001110 10000111100011 10000111100110 10000111110001	0000
15		13 14 15 16	01111000000111 01110011110000 01110011100001 01110011001100	0000		13 14 15 16	10000111111000 10001100001111 1000110001	000
20		17 18 19	01110011000110 01110011000011 01110001111000	0 0		17 18 19	10001100111001 10001100111100 10001110000111	0 0
		20 21 22 23	01110001110001 01110001100110 01110001100011 01110000111100	0000		20 21 22 23	10001110001110 10001110011001 10001110011100 1000111100011	0 0
25		24 25 26 27	01110000111001 01110000110011 01110000011110 0111000000	0 0		24 25 26 27	10001111000110 10001111001100 10001111100001 1000111111	0 0
		28 29 30	01100111110000 01100111100001 01100111001100	0		28 29 30	10011000001111 10011000011110 10011000110011	0
30	1 (A)	31 32 33 34	01100111000110 01100111000011 011001100	0	1 (B)	31 32 33 34	10011000111001 10011000111100 100110011	0 0 0
25		35 36 37	01100110001110 01100110000111 01100011111000	0		35 36 37 38	10011001110001	0 0 0
35		38 39 40 41	01100011110001 01100011100110 01100011100011 01100011001110	0		39 40 41	10011100001110 10011100011001 10011100011100 10011100110001	0000
40		42 43 44	01100011000111 01100001111100 01100001111001	0 0		42 43 44 45	10011100111000 10011110000011 10011110000110	0000
		45 46 47 48	01100001110011 01100001100111 01100000111110 011000000	000		46 47 48	10011110011000	000
4 5		49 50 51 52	01111111001100 011111111000110 011111111	4 4		49 50 51 52	10000011111110 10000110011111 10000111001111	222
		53 54 55	01111110011001 01111110001110 01111110000111	4		53 54 55	10000111110011 10000111111001 10000111111	222222
50		56 57 58	01111100111100 01111100111001 01111100110011	6 6 6		56 57 58 59	10001100011111 10001100111110 10001110001111 10001110011110	
		59 60 61 62	01111100011110 01111100001111 01111001111100 01111001111001	4.4		60 61 62	10001111000111 10001111001110 10001111100011	2 2 2 2
55		63	01111001110011		1	63	10001111100110	2

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Table 4 (CDS \geq 0)

	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class	8-bit data	Modulation codes beginning with "1"	CDS
5		64 .65 66	01111001100111 01111000111110 01111000011111	444		64 65 66	10001111110001 10001111111000 10011000011111	2 2 2
10		67 68 69 70 71 72 73	01110011111100 01110011110011 01110011100111 01110011001111 0111000111111	******		67 68 69 70 71 72 73	10011000111110 10011001100111 100110011	2222222
15		74 75 76 77 78 79	01100111111100 01100111111001 01100111111	******	1 (B)	74 75 76 77 78 79	10011100110011 10011100111001 10011100111100 10011110000111 10011110001110	2 2 2 2
20		80 81 82 83 84 85	01100011111110 01111111000001 011111110011000 0111111	+ 2 2 2 2 2 2	- (80 81 82 83 84 85	10011110011100 10011111000011 10011111000110 100111110001100 100111111	22222224
25		86 87 88 89 90	01111100111000 01111100110001 0111110001100 0111110001100 01111100001110	22222		86 87 88 89 90 91	10001111001111 100011111100111 1000111111	****
30	1 (A)	92 93 94 95 96 97	01111001111000 011110011100110 01111001100011 01111001110011	22222		92 93 94 95 96 97 98	10011111000111 100111111001110 100111111	****
35	1(4)	98 99 100 101 102 103	01111000110011 01111000011110 0111100000111 01110011111000 01110011110011 0111001110011	222222		99 100 101 102 103 104	11000000111111 11000001111110 11000011001113 11000011100111 11000011110011	2 2 2 2 2
40		105 106 107 108 109 110	01110011001110 01110011000111 01110001111100 01110001111001 01110001110011 01110001100111	222222	2 (B)	105 106 107 108 109 110	11000011111100 11000110001111 11000110011110 11000111000111 11000111001110 11000111100011	22222222
45		112 113 114 115 116 117	01110000011111 011001111111000 01100111111	2222		112 113 114 115 116	11000111110001 11000111111000 11001100001111 11001100011110 11001100110011	2 2 2 2
50		118 119 120 121 122 123	01100111000111 01100110011110 011001100	222222		118 119 120 121 122	11001100111100 11001110000111 11001110001110 11001110011001 11001110011100	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
55		124 125 126 127	01100011100111 01100011001111 0110000111111	2 2 2 2		124 125 126 127	11001111000110 11001111001100 11001111100001 1100111111	2 2 2 2

Table 4 (CDS \geq 0)

		0.545	T		·			
	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class	8-bit data	Modulation codes - beginning with "1"	cos
5		128	00111111100000	0		128	11000000011111	
		129	00111111000001	ŏ		129	110000000111110	0
		130	00111110011000	0		130	11000001100111	0
		131 132	00111110001100	0		131 132	11000001110011	0
		133	00111110000011	Ŏ		133	11000001111100	ŏ
10		134	00111100111000	0		134	11000011000111	0
		135 136	00111100110001	0	1	135 136	11000011001110 11000011100011	0
		137	00111100011001	Ŏ	1	137	11000011100110	ŏ
	1	138	00111100001110	0		138	11000011110001	0
15	1	139	00111100000111	0		139 140	11000011111000	0
75	1	141	00111001110001	Ŏ		141	11000110001110	0
		142	00111001100110	0	2/01	142	11000110011001	0
	i	143	00111001100011	0	2 (B)	143	11000110011100	0
	1	145	00111000111001	ŏ		145	11000111000110	Ŏ
20	1 .	146	00111000110011	0		146	11000111001100	0
		147	00111000011110			147	11000111100001	0
		149	00110011111000	0		149	11001100000111	0
	} ;	150	00110011110001	0		150 151	11001100001110	0
		151	00110011100110	0		152	11001100011100	ŏ
25	1	153	00110011001110	0	ì	153	11001100110001	0
	1	154 155	00110011000111	0		154 155	11001100111000	0
	1	156	00110001111001	0		156	11001110000110	ŏ
	1	157	00110001110011	0		157	11001110001100	0
30		158 159	00110001100111	0		158 159	11001110011000	0
30		160	001100000013111	0		160	11001111100000	0
	2 (A)	161	00111111100001	2		161	11001100111110 11001110011110	4
	2 (n)	162 163	00111111001100	2 2		162 163	11001111000111	4
		164	00111111000011	2		164	11001111001110	4
35	1	165 166	00111110011100	2 2 2 2 2 2 2 2 2 2		165 166	1110011111100011	4
	1	167	00111110011001	2	 -	167	11100001111110	7
	1	168	00111110000111	2		168	11100011100111	4
	j l	169	00111100111100	2 2		169 170	11100011110011	4
		171	00111100111001	2		171	11100110011110	I I
40		172	00111100011110	2	3 (B)	172	11100111000111	4
	1	173 174	00111100001111	2 2	J (1)	173 174	111100111001110	4
		175	00111001111001	2		175	11100111100110	4.
		176	00111001110011	2		176	11100111111000	4
45		177 178	00111001100111	2 2		177 178	1111000000111111	2 2
•••	i i	179	00111000011111	2		179	11100001100111	2 2
		180	00110011111100	2		180	11100001110011	2
		181 182	00110011111001	2		181 182	1111000011111001	2
		183	00110011100111	2 2 2 2 2 2 2		183	11100011000111	22222222
50		184	00110011001111	2		184 185	111100011001110	2
		185 186	00110001111110	2		186	11100011100110	2
		187	00111111100110	4		187	11100011110001	2
		188	00111111100011	4		188	11100011111000	2
		189 190	00111111001110	4		189 190	11100110000111 11100110001110	2 2
55		191	00111110011110			191	11100110011001	2
								•

Table 4 (CDS \geq 0)

	23-22	8-bit	Modulation codes	CDS	Class	8-bit	Modulation codes	CDS
_	Class	data	beginning with "O"	W	CIASS	data '	beginning with "1"	
5		192 193	00111110001111	4		192 193	11100110011100	2 2
	I	194	00111100011111	7.4		194	11100111000011 11100111000110	
		195 196	00111001111110	44		195 196	11100111001100	2 2 2 2
	2(A)	197	00110011111110	4		197	11100111100001 11100111110000	2
10		198 199	00011111110000	00		198 199	11100000001111	00
		200	00011111001100	0		200	11100000110011	ŏ
		201 202	00011111000110	0	3 (B)	201 202	11100000111001 11100000111100	0
	1	203	00011110011100	Õ		203	11100001100011	Ö
15		204 205	00011110011001	00		204 20 5	11100001100110 11100001110001	0
		206	00011110000111	0		206	11100001111000	Ö
		207 208	00011100111100	0		207 208	11100011000011 11100011000110	0
		209	00011100110011	0		209	11100011001100	ŏ
20		210 211	00011100011110	0		210 211	11100011100001 11100011110000	0
	Ì	212	00011001111100	0		. 212	11100110000011	0
	1	213 214	00011001111001 00011001110011	0		·213 214	11100110000110 11100110001100	0
	3(A)	215	00011001100111	0		215	11100110011000	0
25		216 217	00011000111110	0		216 217	11100111000001 11100111100000	0
		218	00011111110001	2		218	11110001111100	4
	·	219 220	00011111100110 00011111100011	2 2 2		219 220	111100111111000	4 2
		221	00011111001110	2		221	11110000011110	2
30		222 223	00011111000111	2 2		222 223	11110000110011 11110000111001	2 2
30		224	00011110001111	2 2		224	11110000111100	2
		225 226	00011100111110 00011100011111	2 2	4 (B)	225 226	11110001100011 11110001100110	2 2
		227	00011001111110	2	,	227	11110001110001	2
		228 229	00011000111111	2 4		228 229	11110001111000 11110011000011	+22222222222222
35		230	00011111100111	4		230	11110011000110	2
		231 232	00011111001111	4		231 232	11110011001100 11110011100001	2 2
		233	00011100111111	4		233	11110011110000	
		234 235	00001111111000	0		234 235	111100000000111	0
40	4(A)	236	00001111100110	0		236	11110000011001	Ò
	"(")	237 238	00001111100011	00		237 238	11110000011100	Ö
		239	00001111000111	0		239	11110000111000	0
	1 1	240 241	00001110011110	0		240 241	11110001100001	0
45		242	00001100111110	0 "		242	11110011000001	0
		243 244	00001100011111	0 2	\vdash	243	11110011100000	0 2
		245	00001111110011	2		245	11111000001110	2
		246 247	00001111100111	2 2		246 247	111111000011001	2
50		248 249	00001110011111	2		248	11111000111000	222220
		250	00001100111111	0	5 (B)	249 250	111111001110000	
		251	00000111111001	0		251	11111000000110	0
	5 (A)	252 253	00000111110011	0		252 253	111111000001100 11111000011000	0
55		254	00000111001111	Ö		254	11111000110000	0
		255	00000110011111	0	<u> </u>	255	11111001100000	0

Table 5 (CDS \leq 0)

		8-bit	Modulation codes		Т	8-bir	Modulation codes	
	Class	data	beginning with "0"	CDS	Class	data	beginning with "1"	CDS
5		0	01111110000001	0		0	10000001111110	0
		1	01111100110000	0		1	10000011001111	0
		2 3 4	01111100011000	0		2 3 4	10000011100111 10000011110011	0
			01111100000110	0			10000011111001	0
10		5 6 7	01111100000011	0		5 6	100000111111100 10000110001111	0
		7	01111001100001	Ö		7	10000110011110	0
		8	01111000111000	0		8 9	10000111000111	0
		9	01111000110001	0		10	10000111100011	ŏ
		11	01111000011001	0		11	10000111100110	0
15		12 13	01111000001110	00		12 13	10000111110001	0
		14	01110011110000	0		14	10001100001111	0
		15 16	01110011100001	0		15 16	10001100011110	0
		17	01110011000110	0		17	10001100111001	0
20		18 19	01110011000011	0		18 19	10001100111100	0
		20	01110001110001	0		20	10001110001110	0
		21	01110001100110	0		21 22	10001110011001	0
		23	01110000111100	-0		23	10001111000011	0
25		24	01110000111001	0		24 25	10001111000110	0
		26	01110000011110	Ŏ		26	10001111100001	0
	1	27	01110000001111	0	1	27 28	10001111110000	0
	1	28 29	01100111110000	0		29	10011000011110	ŏ
		30	01100111001100	0		30	10011000110011	0
30		31 32	01100111000110	0	i	31 32	10011000111001	
	1	33	01100110011100	0	4 /2\	33	10011001100011	0
	1 (C)	34 35	01100110011001	0	1 (D)	34 35	10011001100110	
		36	01100110000111	0		36	10011001111000	0
35	1	37	01100011111000			37 38	10011100000111	
	1	38 39	01100011110001	ŏ		39	10011100011001	0
		40	01100011100011	0	ł	40	10011100011100	
	1	41	01100011001110			42	10011100111000	Ŏ
40	İ	43	01100001111100	0	ŀ	43	10011110000011	
40		45	01100001111001	0		44	10011110000110	0
	1	46	01100001100111	ŏ		46	10011110011000	0
		47	01100000111110	0	I .	47	10011111000001	0
		49	01111100000001	-2		49	10000000110011	-4
45		50	01111001100000	-2 -2		50 51	10000000111001	-4
		51 · 52	01111000110000	-2	ļ	52	10000001100011	-4
		53	01111000001100	-2	1	53	10000001100110	- 6
		54	F01111000000110	-2 -2	1	54 55	10000001111000	-4
50		56	01110011100000	-2	1	56	10000011000011	-4
		57 58	01110011000001	-2 -2	1	57 58	10000011000110	-4
		59	01110001100001	-2		59	10000011100001	-4
		60	01110000111000	-2	1	60	10000011110000	-4
		61	01110000110001	-2 -2		61	10000110000011	-4
55		63	01110000011001	-2	1	63	10000110001100	-4
	1	I	1	1		Į.	1	ı 1

Table 5 (CDS \leq 0)

	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class	8-bit data	Modulation codes beginning with "1"	CDS
5		64 65 66	01110000001110 01110000000111 01100111100000	-2 -2		64 65 66	10000110011000	-6 -6
10		67 68 69 70 71 72	01100111000001 01100110011000 011001100	-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -		67 68 69 70 71 72	10001100000011 10001100000110 10001100001100 10001100011000 10001100110000 1000111000000	-4 -4 -4 -4
15	1 (C)	73 74 75 76 77 78 79	01100011100001 01100011001100 01100011000110 01100011000011 01100001110001 01100001110001	******		73 74 75 76 77 78 79	10001111000000 10011000000011 10011000000	-6 -6 -6 -6 -6 -6
20	1(0)	80 81 82 83 84 85	01100001100011 01100000111100 01100000111001 01100000110011 011000000	-2 -2 -2 -2 -2		80 81 82 83 84 85 86	10011100000001 10000000111110 10000001100111 1000000	-4 -2 -2 -2 -2 -2 -2 -2 -2
25		86 87 88 89 90 91	01110000110000 01110000011000 0111000000			87 88 89 90 91 92 93	10000011001110 10000011100011 10000011100010 10000011110001 10000011111000 10000110000111	-2 -2 -2 -2 -2 -2
30		93 94 95 96	01100000111000 01100000110001 0110000001100 011000000	-6 -6 -6	100	94 95 96 97 98	10000110011001 10000110011100 10000111000011 10000111000110	-2 -2 -2 -2 -2
35		96 99 100 101 102 103	00111000001100 00111111000001 001111100110000 00111100011000 00111100001100	-4 -2 -2 -2 -2 -2	1 (0)	99 100 101 102 103 104 105	10000111100001 10000111110000 10001100000111 10001100001110 10001100011001 10001100011100	-2 -2 -2 -2
40	2 (C)	105 106 107 108 109 110	00111100000011 00111001110000 0011100110001 00111000111000 0011100011100 0011100011001	-2 -2 -2 -2 -2 -2 -2		106 107 108 109 110	10001100111000 10001110000011 10001110000110 10001110001100 10001110011000	-22-22-2
45		112 113 114 115 116 117	00111000001110 00111000000111 00110011110000 0011001110001 00110011001100	-2 -2 -2 -2 -2 -2		112 113 114 115 116 117	10001111100000 10011000000111 10011000001110 10011000011001 10011000011000	-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -
50		118 119 120 121 122 123	00110011000011 00110001111000 00110001110011 00110001100110 0011000111100	-2 -2 -2 -2 -2		118 119 120 121 122 123	10011000111000 10011001100001 100110011	-2 -2 -2 -2 -2
55		124 125 126 127	00110000111001 00110000110011 00110000011110 0011000000	-2 -2 -2		124 125 126 127	10011100011000 10011100110000 1001111000000	-2 -2 -2 -2

Table 5 (CDS \leq 0)

	Class	8-bit data	Modulation codes beginning with "O"	CDS	Class	8-bit data	Modulation codes beginning with "1"	CDS
5		128 129	Q0111111100000 Q0111111000001	0 0		128 129	11000000011111	0
10		130 131 132 133 134 135	00111110011000 00111110001100 00111110000110 001111100111000 00111100110001 00111100111001	000000	·	130 131 132 133 134 135	11000001100111 11000001110011 11000001111001 110000011000111 11000011001110 11000011100011	000000
15	2(C)	137 138 139 140 141 142 143	00111100011001 00111100001110 00111100000111 00111001111000 00111001100110 00111001100011	0000000		137 138 139 140 141 142 143	11000011100110 11000011110001 11000011111000 1100011000	0000000
20		145 146 147 148 149 150	00111000111001 00111000110011 00111000011110 00111000001111 00110011111000 00110011110001	00000		145 146 147 148 149 150	11000111000110 11000111001100 11000111100001 11000111110000 11001100000111 11001100001110	000000
25		151 152 153 154 155 156	00110011100110 00110011100011 001100110	000000	·	152 153 154 155 156	11001100011100 11001100110001 110011001	0 0 0 0
30		157 158 159 160 161 162	00110001110011 00110001100111 00110000111110 00110000011111 00110011000001	0000-4-4	2 (D)	157 158 159 160 161 162	11001110001100 11001110011000 11001111000001 11001111100000 11000000	20000
35		163 164 165 166	00110000111000 00110000110001 0011000001100 00110000011001	-4 -4 -4		163 164 165 166 167 168	11000000111001 11000000111100 11000001100011	-2 -2 -2 -2 -2 -2
40	3 (C)	168 169 170 171 172 173 174 175	00011100011000 00011100001100 000111000000	-4 -4 -4 -4 -4 -4 -4		169 170 171 172 173 174 175	11000011000011 11000011000110 11000011001100 11000011100001 1100001110000 1100011000011 11000110000110	-2 -2 -2 -2 -2 -2 -2
45		177 178 179 180 181	00011111100000 000111111000001 000111110011000 00011110001100	-2 -2 -2 -2 -2		177 178 179 180 181	11000110011000 11000111000001 11000111100000 110011000000	-2 -2 -2 -2 -2
50	,	182 183 184 185 186 187 188 189	00011110000011 00011100111000 00011100110001 00011100011100 00011100011100 00011100001110	-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2		182 183 184 185 186 187 188 189	11001100001100 11001100011000 110011001	-2 -2 -2 -2 -2 -2 -4 -4
55		190 191	00011001110001	-2 -2		190 191	11000000111000	-4 -4

Table 5 (CDS \leq 0)

	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class	8-bit data	Modulation codes beginning with "1"	CDS
6		192 193 194 195 196	00011001100011 00011000111100 00011000111001 00011000110011	-2 -2 -2 -2 -2	2 (D)	192 193 194 195 196	11000001110000 11000011000001 11000011100000 1100011000000	-4 -4 -4 -4
10	3(C)	197 198 199 200 201 202	00011000001111 00011111110000 0001111111	20000	3(0)	197 198 199 200 201 202	11001100000001 11100000001111 11100000011110 11100000110011 11100000111001	0 0 0
15		203 204 205 206 207	00011110011100 00011110011001 00011110001110 00011110000111 00011100111100	0 0 0		203 204 205 206 207 208	11100001100011 11100001100110 11100001110001 11100001111000 11100011000011	0000
20		208 209 210 211 212 213 214	00011100110011 00011100011110 00011100001111 00011001111100 00011001111001	0000000	-	209 210 211 212 213 214	11100011001100 11100011100001 11100011110000 11100110000011 11100110000110	000000
25		215 216 217 218 219 220	00011001100111 000110001111110 000110000111111	-4-2	3 (D)	215 216 217 218 219 220	11100110011000 111001111000001 111001111100000 111000000	000222
30	4 (C)	221 222 223 224 225 226	00001111100001 00001111001100 00001111000110 00001111000011 00001110011100	-2 -2 -2 -2 -2 -2		221 222 223 224 225 226	11100000110001 11100000111000 11100001100001 11100001110000 11100011000001	-2 -2 -2 -2 -2 -2
35		227 228 229 230 231 232 233	00001110001110 00001110000111 000011001111001 000011001110011 0000110011011	22.22.22		227 228 229 230 231 232 233	11100110000001 1110011100000 11100000011000 1110000011000 1110000110000	-2 -4 -4 -4 -4
40		234 235 236 237 238 239	00001111111000 00001111110001 00001111100110 00001111100011 00001111001110	000000		234 235 236 237 238 239	11110000000111 11110000001110 11110000011001 1111000011100 11110000110001	0 0 0
45		240 241 242 243 244	00001110011110 00001110001111 00001100111110 00001100011111	000	4 (D)	240 241 242 243 244	11110001100001 11110001110000 11110011000001 11110011100000 1111000000	0000
50	5(C)	245 246 247 248 249 250	00000111110001 00000111100110 00000111100011 00000111000111 00000110001111	~~~~~		245 246 247 248 249 250	11110000001100 11110000011000 11110000110000 11110001100000 111100110000011	-2 -2 -2 -2 -2
55	5.07	251 252 253 254 255	00000111111001 00000111110011 00000111100111 00000111001111 000001110011111	0 0 0	5 (D)	251 252 253 254 255	11111000000110 11111000001100 11111000011000 11111000110000 11111001100000	0 0 0 0

Modulation codes

CDS

TABLE 12

8-bit data

TABLE 13

8-bit data	Modulation codes	CDS
248	00000111001110	-2
249	00000111000111	-2
250	00000110011110	-2
251	00000110001111	-2

5. A digital modulation method for converting 8-bit digital data into 14-bit digital modulation codes, said digital modulation method comprising:

step 1 for selecting up to four 14-bit digital modulation codes for each 8-bit digital data, said 14-bit digital modulation code is selected by the procedures of

- (a) selecting among the 2¹⁴ 14-bit digital codes, a digital code the numbers of consecutive identical bits in which are 6 or less in the first 7 bits, 2 7 from the second bit to 13th bit, and 5 or less in the last 6 bits, and repeating this selecting procedure,
- (b) selecting among the 14-bit digital codes selected at the procedure (a), a digital code the first bit of which is "0", and the CDS of which has the absolute value equal to or less than 6, and repeating this selecting procedure,
- (c) selecting among the 14-bit digital codes selected at the procedure (a), a digital code the first bit of which is "1", and the CDS of which has the absolute value equal to or less than 4, and repeating this selecting procedure,
- (d) selecting among the 14-bit digital codes selected at the procedure (b), a digital code the value of CDS of which is 0, and pairing the selected 14-bit digital code with the reversal code thereof to make the 2 digital codes one group, and repeating this selecting procedure,
- (e) selecting among the 14-bit digital codes selected at the procedure (b), a digital code the value of CDS of which is +2, +4 or +6, selecting among the 14-bit digital codes selected at the procedure

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- (c), a digital code the value of CDS of which is +2 or +4, and combining the two selected 14-bit digital codes with the reversal codes thereof to make the 4 digital codes one group, and repeating this selecting procedure, and
- (f) selecting 256 groups among the groups formed in the above procedures as the 14-bit digital modulation codes;

step 2 for selecting one group of 14-bit digital modulation codes among the 256 groups of the 14-bit digital modulation codes, said selected group corresponding to inputted 8-bit digital data;

step 3 for further selecting one or more 14-bit digital modulation codes in the selected group at step 2, each of the 14-bit digital modulation codes satisfying the requirement that the number of consecutive Identical bits at the joint portion of the preceding 14-bit digital modulation code already selected and the 14-bit digital modulation code to be selected is 2 - 7; and

step 4 for further selecting one 14-bit digital modulation code among the selected modulation codes at step 3 so that said one 14-bit digital modulation code satisfies the requirement that the absolute value of bit DSV for each bit in the modulation code is equal to or less than 8.

6. A digital modulation method as claimed in claim 5, wherein said step 3 comprises the procedures of: selecting any one of the digital modulation codes the first bits of which are "01", "0001", "00001", "000001", and "0000001" when the preceding digital modulation code that has already been selected terminates with "10":

selecting any one of the digital modulation codes the first bits of which are "10", "1110", "11110", "11110", and "1111110" when the preceding digital modulation code that has already been selected terminates with "01";

selecting any one of the digital modulation codes the first bits of which are "110", "1110", "11110", "111110", "01", "0001", "00001", and "000001" when the preceding digital modulation code that has already been selected terminates with "100";

selecting any one of the digital modulation codes the first bits of which are "001", "00001", "000001", "0000001", "10", "110", "1110", and "111110" when the preceding digital modulation code that has already been selected terminates with "011";

selecting any one of the digital modulation codes the first bits of which are "110", "1110", "11110", "111110", "111110", "111110", "011", "0001", and "00001" when the preceding digital modulation code that has already been selected terminates with "1000":

selecting any one of the digital modulation codes the first bits of which are "001", "0001", "00001", "000001", "10", "110", "1110", and "11110" when the preceding digital modulation code that has already been selected terminates with "0111";

selecting any one of the digital modulation codes the first bits of which are "110", "1110", "11110", "111110", "111110", "111110", "01", "001", and "0001" when the preceding digital modulation code that has already been selected terminates with "10000";

selecting any one of the digital modulation codes the first bits of which are "001", "00001", "000001", "0000001", "10", "110", and "1110" when the preceding digital modulation code that has already been selected terminates with "01111";

selecting any one of the digital modulation codes the first bits of which are "110", "1110", "11110", "111110", "1111110", "01", and "001" when the preceding digital modulation code that has already been selected terminates with "100000"; and

selecting any one of the digital modulation codes the first bits of which are "001", "00001", "000001", "0000001", "10", and "110" when the preceding digital modulation code that has already been selected terminates with "011111".

7. A digital modulation method as claimed in claim 5, wherein said step 4 comprises the procedures of: selecting any one of the digital modulation codes the CDS of which are 0, -2, -4, and -6 when the DSV at the end of the preceding 14-bit digital modulation code that has already been selected is +4 or +2;

selecting any one of the digital modulation codes the CDS of which are +4, +2, 0, -2, and -4 when the DSV at the end of the preceding 14-bit digital modulation code that has already been selected is 0; and

selecting any one of the digital modulation codes the CDS of which are +6, +4, +2, and 0 when the DSV at the end of the preceding 14-bit digital modulation code that has already been selected is -2 or -4;

8. A digital modulation method as claimed in claim 5, wherein said digital modulation codes are the codes described in the following Tables 17 and 18.

Table 17 (CDS \geq 0)

	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class		Modulation codes beginning with "1"	CDS
10		0 1 2 3	01111110000001 0111110011000 0111110011000 0111110001100	0000	·	0 1 2 3	10000001111110 1000001100111 10000011100111 10000011110011	0 0
15		4 5 6 7 8 9	0111100000110 01111100000011 01111001110000 01111001110000 011110001100001 01111000110001	0000000		4 5 6 7 8 9	10000011111001 10000011111100 10000110001111 1000011000111 1000011100111 1000011100111	0 0 0
20		11 12 13 14 15 16	01111000011001 01111000001110 01111000000	. 0 0 0 0 0 0		11 12 13 14 15 16 17	10000111100110 10000111110001 100001100001111 10001100011110 10001100111001 1000110011100	0000000
25	1 (A)	18 19 20 21 22 23 24 25	01110011000011 0111000111000 01110001100011 01110001100011 0111000011100 01110000111001	0000000	1 (8)	19 20 21 22- 23 24 28	10001110000111 10001110001110 10001110011001 10001111000011 10001111000110	000000
30		26 27 28 29 30 31 32	011000001110 011000000111 01100111110000 01100111100001 01100111000110 01100111000011	000000		26 27 28 29 30 31 32	10001111100001 100011011110000 10011000001111 100110000110011 10011000111001 10011000111100	000000
35		34 35 36 37 38 39	01100110011001 011001100001110 01100110	0 0 0 0		34 35 36 37 38 39 40	10011001100110 100110011110001 10011001	000000
40		41 42 43 44 45 46 47	01100011001110 01100011000111 01100001111100 01100001110011 01100001100111 01100001110111	0 0 0 0 0		41 42 43 44 45 46 47	10011100110001 10011100111000 1001111000011 1001111000110 1001111001100 1001111000001	0 0 0 0 0
45		48 49 50 51 52 53 54	01100000011111 0111111001001 0111111001100 0111111	2 2 2 2 2		48 49 50 51 52 53	10011111100000 10000011111110 10000110011111 100001111001111 100001111100111 10000111111	0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
50		55 56 57 58 59 50 61	0111100110001 0111100011100 0111110001110 0111110000111 0111100111000	2 2 2 2 2 2 2 2		55 56 57 58 59 60 61	10000111111100 10001100011111 10001100011110 100011100011110 10001111000111	2 2 2 2 2 2 2 2
55		62 63 64 65 66	01111001100110 01111001110001 01111000111001 01111000110011	2 2 2 2 2		62 63 64 65 66	10001111100011 100011111100110 1000111111	2 2 2 2

Table 17 (CDS \geq 0)

		8-bit	Modulation codes		_		Modulation codes	
	Class	data	beginning	CDS	Class	data	beginning	CDS
5			with "O"				with "1"	L1
					•			
		67	01111000011110	2		67	10011000111110	2
		68	01111000001111	2	·	68	10011001100111	2
		69	01110011111000	2		69 70	10011001110011	2
		70	01110011110001	2		71	10011001111001	2
10		71 72	01110011100110	2 2		72	10011001111100	2 2
10		73	01110011001110	2		73	10011100011110	2
		74	01110011000111	2		74	10011100110011	2
	1	75	01110001111100	2	ľ	75	10011100111001	2
	1	76	01110001111001	2		76	10011100111100	2
		77	01110001110011	2	1 (B)	77	10011110000111	2
	1	78	01110001100111	2		78	10011110001110	2
15		79	01110000111110	2	i	79	10011110011001	2
	1	80	01110000011111	2		80 81	10011110011100	2
		81 82	01100111111000	2		82	10011111000011	2 2
		83	01100111100110	2		83	10011111001100	2
		84	01100111100011	•		84	10011111100001	2
		85	01100111001110	1		85	10011111110000	2
	1 (1)	86	01100111000111	2		86	10011111000111	4
20		87	01100110011110	8		87	11000011111110	4
		88	01100110001111	2		68	11000110011111	4
		89	01100011111100	2		89	11000111001111	4
		90	01100011111001	2		90	11000111100111	4
	1	91	01100011110011	2		91 92	11000111110011	4
	l	92 93	01100011100111	2		93	11000111111001	1
25		94	01100001111110	l i l		94	11001100011111	4
	1	95	01111111001100			98	11001100111110	4
	1	96	01111111000110	1 4 1		96	11001110001111	4
		97	01111111000011	4		97	11001110011110	4
		98	Q1111110011100	4		98	11001111000111	4
	l	99	01111110011001	4	•	99	11001111001110	4
30	l	100	01111110001110	4		100	11001111100011	4
30	1	101	01111110000111	1		101	11000001111110	2 2
		102	01111100111100	1	1	103	11000011100111	2
		104	01111100110011	1		104	11000d11110011	2
	Ì	105	01111100011110	i i		105	11000011111001	2
	1	106	01111100001111	4	2 (B)	106	11000011111100	2
	1	107	01111001111100	4	4 (D)	107	11000110001111	2
35	l	108	01111001111001	4	i	108	11000110011110	2
	1	109	01111001110011	1 4	['	109	11000111000111	2
	1	1110	01111001100111			1110	11000111001110	2 2
	1	1112	01111000011111	1 7		iiż	11000111100110	2
	I	113	01110011111100	li	i :	113	11000111110001	2
	1 .	114	01110011111001	4		114	11000111111000	2
40	1	115	01110011110011	4		118	11001100001111	2
	I	116	01110011100111	4		116	11001100011110	2
	l	117	01110011001111	1 5		117	11001100110011	2
	1	118	01110001111110	1 1		118	11001100111001	2 2
	ļ	119	01100111111100	1 4		120	110011100111100	2
	1	121	01100111110011	i	1	121	11001110001110	2
45	}	122	01100111100111	14		122	11001110011001	2
45	1	123	01100111001111	14	l	123	11001110011100	2
	1	124	01100110011111	4	1	124	11001111000011	2
	l	125	01100011111110	4	1	125	11001111000110	2
	ì	126	01111111000111	5		126	11001111001100	2
	ŀ	127	01111110001111	5		127	11001111100001	2
]	128	01111100011111	6	{	128	11001111110000	2 0
50]	129	00111111100001	6	i	130	11000000111110	٥I
	2 (4)	131	00111110011000	l ŏ		131	11000001100111	ŏ
	2 (A)	132	00111110001100	lō		132	11000001110011	ŏ
	1	133	00111110000110	1 0	Į.	133	11000001111001	ŏ
	•	•	•	, .	•	1	,	. 1

Table 17 (CDS ≥ 0)

		8-bit	Modulation codes		<u> </u>	8-bit	Modulation codes	
	Class	data	beginning	CDS	Class	data	beginning	CDS
]		with "O"	-	02.00	4444	with "1"	323
5		هي کنکنب	,		٠.			
		134	00111110000011	0		134	11000001111100	0
		135	00111100111000	0		135	11000011000111	°
		136	00111100110001	0		136	11000011001110	ŏ
		138	00111100011001	Ŏ		138	11000011100110	0
10		139	00111100001110	0		139	11000011110001	0
10		140	00111100000111	0		140	11000011111000	0
•		142	00111001110001	ŏ		142	11000110001110	0
		143	00111001100110	0		143	11000110011001	0
		144	00111001100011	0	1	144	11000110011100	0
	1	145	00141000111100	ŏ	a /B\	146	11000111000110	اةا
15	Ì	147	00111000110011	0	2 (B)	147	11000111001100	0
	ł	148	00111000011110)	1	1.148	11000111100001	
	ļ	149	00111000001111		1	149	11001100000111	l ŏ
		151	00110011110001	0		151	11001100001110	0
	1	152	00110011100110	0	1	152	11001100011001	
20		153	00110011100011	0	1	153	11001100011100	
20	1	155	00110011000111	0	l .	155	11001100111000	0
		156	00110001111100	0	1	156	11001110000011	
		157	00110001111001			157	11001110000110	اۃا
		159	00110001100111	ŏ	1	159	11001110011000	0
	2 (A)	160	00110000111110	0	I	160	11001111000001	0
25	1	161	00110000011111	1 2	1	161	11001111100000	0
	1	162	00111111100001	2 2	l .	162	11001111100110	1
	1	164	00111111000110	2	I	164	110011111111000	4
	1	165	00111111000011	2		168	11100001111110	4
	l	155	00111110011100	2 2		166	11100011001111	
20	1	167	00111110001110	1 2		168	11100011110011	4
30	Į.	169	00111110000111	2		169	11100011111001	4
		170	001111001111100	2 2	ł	170	111000111111100	1 4
•		171	00111100111001	1 2	l l	172	11100110011110	4
	1	173	00111100011110	2	1	173	11100111000111	1 4
	1	174	00111100001111	2 2	1	174	11100111001110	1 4
35	1	178	00111001111100	2	1	176	11100111100110	1 4
		177	00111001110011	2	ł	177	111001111110001	1 4
	1	178	00111001100111	2 2		178	11100111111000	1 4
	i	179	00111000111110	2		180	11100000111110	2
	1	181	00110011111100	2	3 (B)	181	11100001100111	2
40	1	182	00110011111001	2	1 '''	182	11100001110011	2 2
40	· {	183	00110011110011	2 2		183	11100001111001	1 2
		184			1	188	11100011000111	2
		186	00110001111110	2.	- [186	11100011001110	
		187			1	187	11100011100011	
	1	188			1	189	11100011110001	2
45	1	190	00111111000111	4		190	11100011111000	2
	1	191				191	11100110000111	
		192				192	11100110001110	
	1	194				194	11100110011100	2
		195	0011100111111	4	4	195	11100111000011	
50		196			1	196	11100111000110	
50	- {	197		1 1	1	198	11100111100001	
		199			1	199	11100111110000	
	L		<u>· l</u>	<u> </u>	_	J	I .	1

Table 17 (CDS \geq 0)

5	Class	8-bit data	Modulation codes beginning with "0"	cos	Class		Modulation codes beginning with "1"	CDS
10	-	200 201 202 203 204 205 206 207 208 209 210 211 212	0001111110000 00011111100001 00011111000110 00011111000110 000111100011100 0001110011100 0001110001110 0001110011110 00011100111100 00011100111100	000000000000	3 (8)	200 201 201 202 203 204 205 206 207 208 209 210 211 211 213	11100000001111 11100000011110 11100000110011 11100000111001 11100001100011 111000011000110 11100001110001 11100011000011 11100011000110 111000110100110 111000110100011	000000000000000000000000000000000000000
20	3 (A)	214 215 216 217 218 219 220 221	00011100001111 00011001111001 000110011	000000		214 215 216 217 218 219 219	11100110000011 11100110000110 111001100	0 0 0 0 0 0 2 2 2
25		223 224 225 225 227 228 229 230 231 232	00011111100011 00011111001110 00011110001111 00011110001111 000111000111110 0001110111111	2222222444	4 (B)	212 224 224 226 227 238 239 230 231 232	1111000011001 11110000111001 11110001110001 11110001100010 11110001110001 1111001111000 1111001100	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
30	4 (A)	233 294 238 236 237 238 239 240 241	00011110011111 000011111110001 0000111111	0 0 0 0 0 0 0		233 234 238 236 237 238 239 240 241	11110011110000 111100000001110 11110000011001 11110000111001 11110000111000 11110000111000 111100011100001	2000000000
40		242 243 244 245 245 247 248	00001100111110 00001100011111 0000111111	2 2 2 2 2	5 (B)	243 244 245 246 247 248	11110011000001 1111001110000011 1111100011100 1111100011000 1111100111000	2 2 2 2 2
* U	5 (A)	249 250 251 252 253 254 255	0000011111100 00000111110011 00000111100111 00000111001111 00000111111	00000	8 (8)	249 250 251 252 253 - 254	11111000000011 1111100001100 1111100011000 1111100110000 11111001100000	0 0 0 0 0

Table 18 (CDS \leq 0)

5	Class	8-bit data	Modulation codes beginning with "O"	CDS	Class	8-bit data	Modulation codes beginning with "1"	CDS
. 10		0 1 2 3 4 5 6 7 8	01111110000001 01111100110000 01111100011000 01111100001100 01111100000110 011111001110000 0111110011100001	00000000		0 1 2 3 4 5 6 7 8	10000001111110 1000001100111 1000001110011 10000011110011 1000001111100 10000110001111 10000110001111	00000000
15		9 10 11 12 13 14 15 16	01111000110001 0111100001100 01111000011001 01111000000	000000000		9 10 11 12 13 14 15	100001-11001110 10000111100011 1000011110001 1000011111000 10001100001111 10001100011110 100011001110011	00000000
20		18 19 20 21 22 23 24 25	01110011000011 01110001111000 01110001110001 01110001100011 0111000011100 01110000111001 011100001110011	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 (0)	18 19 20 21 22 23 24 25 26	10001100111100 10001110000111 10001110001110 1000111001100 1000111000111 1000111100011 10001111001100 1000111100010	000000000000000000000000000000000000000
25	1 (C)	27 28 29 30 31 32 33	01110000001111 01100111110000 01100111100001 01100111001100 01100111000110 01100110011100011	00000000	1 (D)	27 28 29 30 31 32 33	10001111110000 10011000001111 10011000011010 10011000111001 10011000111100 10011001100011	00000000
35		35 36 37 38 39 40 41 42 43	01100110001710 01100110000171 01100011111000 011000111100110 01100011100011 01100011001110 01100011000111	00000000		35 36 37 38 39 40 41 42 43	10011001111000 10011001111000 10011100000111 10011100001110 10011100011100 10011100111000 10011100111000	0 0 0 0 0 0 0 0 0
40		44 45 46 47 48 49 50 51 52	01100001111001 01100001110011 01100001100111 011000000	0 0 0 0 -2 -2 -2 -2		44 45 46 47 48 49 50 51	10011110000110 10011110001100 10011111000100 1001111100000 100111111	0 0 0 0 -2 -2 -2
45		54 55 56 57 58 59	0111100001110 0111100000111 01111001100	-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2		53 54 55 56 57 58 59 60	10000001111100 10000011000111 10000011001110 1000001100011 10000011100110 10000011110001 100000111110001	-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -
50		61 62 63 64 65	01110000011100 01110000011001 0111000000	-		61 62 63 64 65 66	10000110011001 10000110011100 1000011100011 10000111000110	-2 -2 -2 -2

Table 18 (CDS \leq 0)

	1	8-bit	Modulation codes			8-bit	Modulation codes	
	Class	data	beginning	CDS	Class		beginning	CDS
5	02000		with "0"				with "1"	
		67	01100111000001	-2		67	10000111100001	-2
i	!	68	01100110011000	-2		68	. 10000111110000	-2
		69	01100110001100	-2		69	10001100000111	-2
		70 71	01100110000110	-2		70 71	10001100001110	-2 -2
10	1	72	01100110000011	-2	l l	72	10001100011100	-2
,,,		73	01100011100001	-2		73	10001100110001	-2
	1	74	01100011001100	-2		74	10001100111000	-2 -2
		75 76	01100011000110	-2 -2	ł	75. 76	10001110000011	-2
		77	01100001111000	-2		77	10001110001100	-2
	1 (C)	78	01100001110001	-2		78 79	10001110011000	-2 -2
15		79 80	01100001100110	-2 -2		80	10001111000001	-2
	1	81	01100000111100	-2		81	10011000000111	-2
	ļ	82	01100000111001	-2		82	10011000001110	-2
		83	01100000110011	-2 -2		83 84	10011000017001	-2 -2
		85	01100000001111	-2 .		85	10011000110001	-2
20		86	01100000111000	-6	1 (0)	86	10011000111000	-2
20		87	00111100000001	-4	. \"	87 88	10011001100001	-2 -2
	!	89	00111000110000		1	89	10011100000011	-2
	[90	00111000011000	-4		90	10011100000110	-2 -2
	ļ	91	00111000001100	-;	l	91 92	10011100001100	-2
	1	93	00111000000011		1	93	10011100110000	-2
25	1	94	00110011100000	-4		94	10011110000001	-2
	ļ	95	00110011000001		L	95 96	10000000110011	-4
		96	00110001110000			97	10000000111001	
	İ	98	00110000111000	-i	1	98	10000001100011	-4
	2 (C)	99	00110000110001	-4	1	99	10000001100110	-4
30	1,	100	00110000011100	- 6 - 2		100	10000001110001	
30	ł	102	00111100110000	-2	1	102	10000011000011	-4
	ì	103	00111100011000	-2	1	103	10000011000110	- 4
	1	104	00111100001100	-2 -2	ŀ	104	10000011001100	-4
	}	105	00111100000110	-2	1	106	10000011110000	-4
	1	107	00111001110000	-2	ł	107	10000110000011	-4
35	1	108	00111001100001	-2		108	10000110000110	-4
		109	00111000111000	-2 -2		110	10000110011000	-4
	i	iii	00111000011100	-2	i	111	10000111000001	-4
	1	112	00111000011001	-2	1	112	10000111100000	-4
	1	113	00111000001110	-2 -2	•	114	10001100000110	-4
40		115	00110011110000	-2	1	115	10001100001100	-4
70	1	116	00110011100001	-2	1	116	10001100011000	-4
	1	117	00110011001100	-2 -2	1	117	10001100110000	
		119		-2	f	119	10011000000011	-4
		120	00110001111000	-2	1	120	10011000000110	-4
	1	121	00110001110001	-2		121	10011000001100	1 - 4
45		123	00110001100110	-2		123	10011000110000	-4
		124	00110000111100	-2		124	10011001100000	
		125	00110000111001		ı	125	10011100000001	-4
		126 127	00110000110011		1	126	10000000111000	-6
		128	00110000001111		L	128	10000011100000	
50		129	00111111100000	0		129	11000000011111	0
••		130	00111111000001		2 (D)	130	11000000111110	
	1	132	00111110011000		1 4 (0)	132	11000001100111	0
		1	1 00111110001100	, ,	•			, •

Table 18 (CDS \leq 0)

	Class	8-bit data	Modulation codes beginning with "0"	CDS	Class		Modulation codes beginning with "1"	CDS
5		133, 134 135	00111110000110 00111110000011 00111100111000	. 0 0 0		133 134 135	11000001111001 11000001111100 11000011000111	0 0 0
10		136 137 138 139 140 141	00111100110001 00111100011100 00111100011001 00111100001110 001111001111000	000000	·	136 137 138 139 140 141	11000011001110 11000011100111 11000011100110 110000111110001 11000011111000	000000
15	2 (C)	143 144 145 146 147 148 149	00111001100110 00111001100011 0011100011100. 00111000110011	000000		143 144 145 146 147 148	11000110011001 11000110011100 11000111000011 11000111001100 11000111100001	0 0 0 0
20		150 151 152 153 154 155	00110011111000 00110011110001 00110011100110 00110011100111 00110011001111	0000		150 151 152 153 154 155	11001100000111 11001100001110 11001100011001 11001100011000 11001100111000 11001110000011	000000
25		157 158 159 160 161 162 163	00110001111001 00110001110011 00110001100111 00110000111110 00110000011101 0011000000	00000+4	2 (D)	157 158 159 160 161 162 163	11001110000110 11001110001100 11001110011000 1100111100000 11001111100000 11000000	000022
30		164 165 166 167 168 169 170	00110000000111 00011110000001 0001110011000 00011100001100 00011100000110 00011100000110	-4 -4 -4 -4 -4		164 165 166 167 168 169 170	11000000111001 11000001101001 1100000110001 1100000110001 1100000111000 1100001100001	-2 -2 -2 -2 -2 -2 -2
35	3 (C)	171 172 173 174 175 176 177	00011001110000 00011001110001 00011000111000 00011000011000 00011000001100 00011000001110	-4 -4 -4 -4 -4 -4		171 172 173 174 175 176 177	11000011000110 11000011001100 11000011100000 110000111000011 11000110000110 11000110001100	-2 -2 -2 -2 -2 -2 -2 -2
40		179 180 181 182 183 184	00011111100000 00011111000001 00011110001100 00011110001100 0001111000011 00011110000011	-2 -2 -2 -2 -2 -2		179 180 181 182 183 184	1100011100000 11000111100000 110011000000	-2 -2 -2 -2 -2 -2 -2 -2
45		186 187 188 189 190 191	00011100110001 00011100011100 00011100011001 00011100001110 00011100000111	-2 -2 -2 -2 -2 -2 -2 -2		-186 187 188 189 190 191	11001110000001 11000000011001 1100000011100 11000000	-2 -4 -4 -4 -4 -4
50		193 194 195 196 197 198	00011001100110 00011001100011 00011000111100 00011000111001 000110001110011 00011000011110	-2 -2 -2 -2 -2 -2 -2		193 194 195 196 197 198 199	1100001100000 11000011100000 1100011000000	-4 -4 -6 -6

Table 18 (CDS \leq 0)

		8-bit	Modulation codes		T	8-bit	Modulation codes	
	Class	data	beginning	CDS	Class	data	beginning	CDS
5			with "0"				with "1"	
		200	00011111110000	. 0		200	11100000001111	0
		201 202	00011111100001	0	ļ	201 202	11100000011110	0
		203	00011111000110	ŏ		203	11100000111001	0
		204 205	00011111000011	0		204 205	11100000111100	0
10		206	00011110011100	ŏ	ĺ	206	11100001100110	ŏ
		207	00011110001110	0		207	11100001110001	0
	2 (0)	208 209	00011110000111 00011100111100	0		208 209	11100001111000 1110001100001	0
	3 (C)	210	00011100111001	ŏ	·	210	11100011000110	0
	·	211 212	00011100110011	0		211 212	11100011001100	0
15		213	00011100011110	0		213	11100011110000	l ŏ l
,0		214	00011001111100	0		214	11100110000011	0
		215 216	00011001111001	8		215 216	11100110000110 11100110001100	8
	ļ	217	00011001100111	ŏ	3 (D)	217	11100110011000	Ö
		218 219	00011000111110	. 6		218 219	11100111000001	0
20		220	00001111110000	-2		220	111000000001110	-2
20	ì	221	00001111100001	-2	1	221	11100000011001	-2 -2
	İ	222	00001111001100	-2 -2		222 223	11100000011100	-2
	1	224	00001111000011	-2		224	11100000111000	-2
	ļ	225 226	00001110011100	-2 -2		225 226	11100001100001	-2 -2
05		227	00001110001110	-2		227	11100011000001	-2
25	ļ	228	00001110000111	-2		228 229	11100011100000	-2 -2
	4 (C)	230	00001100111100	-2 -2		230	11100000001100	-4
	1 (0)	231	00001100110011	-2		231	11100000011000	-4
	1	232	00001100011110	-2 -2		232 233	11100000110000 1110000110000	-4
	1	234	000011111111000	ō		234	11110000000111	0
30	1	235	00001111110001	0	1	235 236	11110000001110	0
	1	237	00001111100011	0		237	11110000011100	Ŏ
	1	238	00001111001110	0	l l	238 239	11110000110001	0
	!	240	00001111000111	0	1	240	11110001100001	
		241	00001110001111	0	4 (0)	241	11110001110000	0
35	1	242	00001100111110	0	1	242	11110011000001	0
		266	00000111111000	-2	1	244	11110000000110	-2
	}	245	00000111100011	-2		245	11110000001100	-2 -2
		247	00000111001110	-2 -2		246 247	11110000110000	-2
	5 (C)	248	00000110001111	-2		248	11110001100000	-2
40	1	249	00000111111100	8		249 250	11111000000011	0
		251	00000111110011	Ō	5 (D)	251	11111000001100	0
	l	252	00000111100111	0		252 253	11111000011000	
		254	00000110011111	l ö		254	11111001100000	0
	8 (C)	255	00000011111110	0	8 (0)	255	11111100000001	0

Patentansprüche

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1. Digitales Modulationsverfahren zum Umsetzen von digitalen 8-Bit-Daten in digitale 14-Bit-Modulationscodes, gekennzeichnet durch:

einen Schritt 1 zum Wählen von bis zu vier digitalen 14-Bit-Modulationscodes für jeden digitalen 8-Bit-Datenwert, wobei der digitale 14-Bit-Modulationscode durch Prozeduren gewählt wird, bei denen (a) aus 2¹⁴ digitalen 14-Bit-Codes ein digitaler Code gewählt wird, in welchem die Anzahl von aufeinanderfolgenden identischen Bits in den ersten 6 Bits 5 oder weniger, von dem 2. Bit bis zu dem 13. Bit 2 bis 7 und in den letzten 7 Bits 6 oder weniger beträgt, wobei der Absolutwert der digitalen Codewortsumme CDS des gewählten digitalen Codes 4 oder weniger beträgt, und diese Wählprozedur wieder-

holt wird.

(b) aus den bei der Prozedur (a) gewählten digitalen 14-Bit-Codes ein digitaler Code, dessen erstes Bit "0" ist und dessen Wert der digitalen Codewortsumme CDS 0 ist, und der gewählte digitale 14-Bit-Code mit dem Umkehrcode desselben zu einer Gruppe aus 2 digitalen Codes zusammengefaßt wird, oder aus dem aus der Prozedur (a) gewählten digitalen 14-Bit-Codes ein digitaler Code gewählt wird, dessen erstes Bit "1" ist und dessen Wert der digitalen Codewortsumme CDS +2 oder +4 ist, die gewählten digitalen 14-Bit-Codes mit dem Umkehrcodes derselben kombiniert werden und weiterhin die beiden digitalen 14-Bit-Codes mit einem bei der vorangehenden Prozedur gewählten Paar von digitalen 14-Bit-Codes zum Bilden einer Gruppe aus 4 digitalen Codes kombiniert werden und diese Wählprozedur wiederholt wird.

- (c) aus den bei der Prozedur (a) gewählten digitalen 14-Bit-Codes ein digitaler Code, dessen erstes Bit "0" ist und dessen Wert der digitalen Codewortsumme CDS +2 ist, und ein anderer digitaler Code gewählt wird, dessen erstes Bit "1" ist und dessen Wert der digitalen Codewortsumme CDS +2 oder +4 ist, die beiden gewählten digitalen 14-Bit-Codes mit deren Umkehrcodes zu einer Gruppe aus 4 digitalen Codes kombiniert werden und diese Wählprozedur wiederholt wird,
- (d) aus den bei der Prozedur (a) gewählten digitalen 14-Bit-Codes ein digitaler Code, dessen erstes Bit "0" ist und dessen Wert der digitalen Codewortsumme CDS +4 ist, und ein anderer digitaler Code gewählt wird, dessen erstes Bit "1" ist und dessen Wert der digitalen Codewortsumme CDS +2 ist, die beiden gewählten digitalen 14-Bit-Codes mit deren Umkehrcodes zum Bilden eine Gruppe aus 4 digitalen Codes komblnlert werden und diese Wählprozedur wiederholt wird, und
- (e) aus den bei den vorangehenden Prozeduren gebildeten Gruppen als digitale 14-Bit-Modulationscodes 256 Gruppen gewählt werden,

einen Schritt 2, bei dem aus den 256 Gruppen von digitalen 14-Bit-Modulationscodes eine Gruppe von digitalen 14-Bit-Modulationscodes gewählt wird, die dem eingegebenen digitalen 8-Bit-Datenwert entspricht,

einen Schritt 3, bei dem weiterhin in der bei dem Schritt 2 gewählten Gruppe mindestens ein digitaler 14-Bit-Modulationscode gewählt wird, der jeweils der Erfordernis genügt, daß die Anzahl von aufeinanderfolgenden identischen Bits an dem gemeinsamen Abschnitt des schon gewählten vorangehenden digitalen 14-Bit-Modulationscodes und des zu wählenden digitalen 14-Bit-Modulationscodes 2 bis 7 beträgt,und

einen Schritt 4, bei dem aus den bei dem Schritt 3 gewählten Modulationscodes weiter hin ein digitaler 14-Bit-Modulationscodes derart gewählt wird, daß dieser eine digitale 14-Bit-Modulationscode der Erfordernis genügt, daß der Absolutwert des digitalen Bit-Summenwertes DSV für jedes Bit in dem Modulationscode gleich 7 oder geringer ist.

2. Digitales Modulationsverfahren nach Anspruch 1, dadurch gekennzeichnet, daß der Schritt 3 Prozeduren umfaßt, bei denen

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "10" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "01", "001", "0001", "00001" oder "000001" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "01" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "10", "110", "1110", "11110" oder "111110" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "100" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "110", "1110", "11110", "11110" oder "01", "001", "0001", "00001" oder "000001" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "011" endet, irgendelner der digitalen Modulationscodes gewählt wird, dessen erste Bits "001", "00001", "000001", "10", "1110", "11110" oder "111110" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "1000" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "110", "1110", "11110", "11110", "001", "0001" oder "00001" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "0111" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "001", "00001", "000001", "10", "110", "1110" oder "11110" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "10000" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "110", "1110", "11110", "01", "001" oder "0001" sind,

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dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "01111" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "001", "0001", "00001", "000001", "110", "110" oder "1110" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "100000" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "110", "1110", "11110", "01" oder "001" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "011111" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "001", "0001", "00001", "000001", "10" oder "110" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "1000000" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "110", "1110", "11110", "111110" oder "01" sind, und

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "0111111" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "001", "0001", "00001", "000001" oder "10" sind.

 Digitales Modulationsverfahren nach Anspruch 1, dadurch gekennzeichnet, daß der Schritt 4 Prozeduren umfaßt, bei denen

dann, wenn der digitale Summenwert DSV an dem Ende des schon gewählten vorangehenden digltalen 14-Bit-Modulationscodes +2 ist, Irgendeiner der digitalen Modulationscodes gewählt wird, dessen Codewortsumme CDS 0, -2 oder -4 ist,

dann, wenn der digitale Summenwert DSV an dem Ende des schon gewählten vorangehenden digitalen 14-Bit-Codes 0 ist, irgendeiner der digitalen Modulationscodes gewählt wird, dessen Codewortsumme CDS +2, 0 oder -2 ist, und

dann, wenn der digitale Summenwert DSV an dem Ende des schon gewählten vorangehenden digitalen 14-Bit-Modulationscodes -2 ist, irgendeiner der digitalen Modulationscodes gewählt wird, dessen Codewortsumme CDS +4, +2 oder 0 ist.

4. Digitales Modulationsverfahren nach Anspruch 1, dadurch gekennzelchnet, daß die bei dem Schritt 1 erhaltenen digitalen Modulationscodes die in den nachstehenden Tabellen 4 und 5 angeführten Codes oder die durch Ersetzen eines Teils der Tabelle 4 durch die nachstehende Tabelle 12 erhaltenen Codes oder die durch Ersetzen eines Teils der Tabelle 5 durch die nachstehende Tabelle 13 erhaltenen Codes sind.

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Tabelle 4 (CDS ≥ 0)

	Klasse	8-Bit-	Modulations codes,	cos	Klasse	8-Bit-	Modulationscodes,	æs
5		Daten	beginnend mit "0"			Daten	beginnend mit "1"	
10		0 1 2 3 4 5 6 7	0111111000001 0111110011000 0111110001100 0111110001100 0111110000110 0111110000011 0111100111000	0000000		0 1 2 3 4 5 6	10000001111110 1000001100111 10000011100111 10000011110011 10000011111001 100000111111	0000000
15		8 9 10 11 12 13 14 15	01111000111000 01111000110001 01111000011001 011110000011001 01111000000	0000000		8 9 10 11 12 13 14 15	10000111000111 10000111001110 10000111100110 10000111100110 1000011111000 100011111000 100011000011110 10001100011110	00000000
20		17 18 19 20 21	01110011001100 01110011000110 01110011000011 01110001111000 01110001110001 01110001100011	00000		17 18 19 20 21 22	10001100111001 10001100111100 10001110000111 10001110001110 10001110011001	00000
25	-	23 24 25 26 27 28 29	01110000111100 0111000011001 01110000110011 01110000011110 0111000000	000000		23 24 25 26 27 28 29	10001111000011 10001111000110 1000111100001 1000111110000 1000111111	000000
30	1 (A)	30 31 32 33 34 35	01100111001100 01100111000110 01100111000011 01100110011100 01100110011001 01100110001110	00000	1 (B)	30 31 32 33 34 35	10011000110011 10011000111001 10011000111100 10011001100011 10011001100110 10011001110001	00000
35		36 37 38 39 40 41	01100110000111 01100011111000 01100011110001 01100011100110 01100011100011 01100011001110	000000		36 37 38 39 40 41	10011001111000 10011100000111 10011100001110 10011100011001 100111000110001	00000
40		42 43 44 45 46 47	01100011000111 01100001111100 01100001111001 01100001110011 011000011100111	000000		42 43 44 45 46 47 48	10011100111000 10011110000110 10011110001100 10011110011000 10011111000001 100111111	000000
45		48 49 50 51 52 53	01100000011111 01111111001100 011111111	44444		49 50 51 52 53	10000011111110 10000110011111 10000111001111 10000111100111	*********
50		54 55 56 57 58 59 60 61	01111110001110 01111110000111 01111100111100 01111100111001 01111100110011 01111100011110 01111100011111	444444		54 55 56 57 58 59 60 61	10000111111001 10000111111100 10001100011111 100011000111110 100011100011110 10001111000111	2222222
55		62 63	01111001111001			62 63	10001111100011	2 2

Tabelle 4 (CDS \geq 0)

	Klasse	8-Bit-	Modulationscodes,	CDS	Klasse	8-Bit-	Modulationscodes,	cos
5		Daten	beginnend mit "0"			Daten	beginnend mit "1"	
10		64 .65 66 67 68 69 70	01111001100111 01111000111110 01111000011111 011100111111	*******		64 65 66 67 68 69 70	10001111110001 10001111111000 10011000011111 10011000111110 10011001110011 10011001110011 10011001111001 10011001111001	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
15		72 73 74 75 76 77 78	01110001111110 01110000111111 01100111111	*******		72 73 74 75 76 77 78	10011100001111 10011100011110 10011100111001 10011100111001 1001110000111 10011110000111	2 2 2 2 2 2 2
20		79 80 81 82 83 84 85	01100110011111 011000111111110 011111111	4+222222	1 (B)	79 80 81 82 83 84	10011110011001 10011110011100 10011111000110 10011111001100 100111111	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
25		86 87 88 89 90	01111100111000 01111100110001 01111100011100 01111100011001 01111100001110 '01111100000111	2222	·	86 87 88 89 90 91	10001111001111 100011111100111 1000111111	4444
30		92 93 94 95 96 97	01111001111000 01111001110001 01111001100110 01111001100011 01111000111.00 01111000111001	2222		92 93 94 95 96	10011110011110 10011111100111 100111111001110 100111111	4446
35	1 (A)	98 99 100 101 102 103	01111000110011 01111000011110 01111000001111 01110011111000 01110011110011	22222		98 99 100 101 102 103	11000111110011 11000000111111 1100000111111	4 2 2 2 2 2 2 2 2 2
40		104 105 106 107 108 109	01110011100011 01110011001110 01110011000111 01110001111100 01110001111001 01110001110011	222222	2 (B)	104 105 106 107 108 109	11000011111001 110000111111100 11000110001111 11000110011110 11000111001110 11000111100011	222222
45		111 112 113 114 115 116 117	01110000111110 01110000011111 01100111111	222222		111 112 113 114 115 116 117	11000141100110 110001111110001 110001111111000 11001100001111 110011001110011 11001100111001	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
50		118 119 120 121 122 123 124	01100111000111 01100110011110 011001100	2222222222222		118 119 120 121 122 123 124	11001100111100 11001110000111 11001110011001 11001110011001 110011110011100 11001111000110 11001111000110	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
55		125 126 127	01100011001111 01100001111110 01100000111111	2 2		125 126 127	110011111100001	2 2 2

Tabelle 4 (CDS \geq 0)

)
5	Klasse	8-Bit-	Modulationscodes,	CDS	Klasse		Modulations codes,	CDS	
		Daten	beginnend mit "0"			Daten	beginnend mit "1"	L	
		128	00111111100000	0		128	11000000011111	0	
		129 130	00111111000001	0	1.	129 130	11000000111110	0	١
		131	00111110001100	ŏ		131	11000001110011	.0	l
10		132	00111110000110	0		132	11000001111001	0	
		133 134	00111110000011	0		133 134	11000001111100 11000011000111	0	ı
		135	00111100110001	ŏ		135	11000011001110	Ō	l
	[:	136	00111100011100	0		136	11000011100011	0	l
	-	137 138	00111100011001	0		137 138	11000011100110 11000011110001	0	
15		139	00111100000111	ŏ	1. 1	139	11000011111000	Ŏ.	ı
		140:	00111001111000	0		140	11000110000111	0	
		141	00111001110001	0		141	11000110001110 11000110011001	0	1
	Ì	143	00111001100011	ŏ	2 (B)	143	11000110011100	Ŏ	
		144	00111000111100	0		144	11000111000011	0	ľ
20		145	00111000111001	0	l i	145 146	11000111000110	. 0	l
		146	00111000110011	0		147	11000111100001	Ö.	١.
	!.	148	00111000001111	0		148	11000111110000	0	l
	1	149	00110011111000	0	l i	149 150	11001100000111 11001100001110	00	į.
25	-	150 151	00110011110001	0		151	11001100011001	ŏ	١.
		152	00110011100011	0	l 1	152	11001100011100	Ò	ļ
		153	00110011001110	0	1	153 154	11001100110001	0	l
	1	154	00110011000111	0		155	11001110000011	ä	1
	1	156	00110001111001	Ŏ		156	11001110000110	0	١
30		157	00110001110011	0		157 158	11001110001100	0	١
		158 159	00110001100111	0		159	11001111000001	ŏ	l
		160	00110000011111	0	ll	160	11001111100000	0	
	2 (A)	161	00111111100001	2	1	161 162	111001100111110	;	ł
	1 2 100	162	00111111001100	1 2	1	163	11001111000111	4	l
35		164	00111111000011	2		164	11001111001110	1	I
		165	00111110011100	2		165 166	11001111100011	1 2	l
	1	166	00111110011001	2222222	\vdash	167	11100001111110	+	1
	·	168	00111110000111	2		168	11100011100111	1	١
		169	00111100111100	2 2		169 170	1111000111110011	1	ı
40	l	170	00111100111001	2		171	11100110011110	1	l
		172	00111100011110	2	3 (B)	172	11100111000111	!	l
	ŀ	173	00111100001111	2	3(6)	173 174	11100111001110	‡	l
		174 175	00111001111100	2		175	11100111100110	4.	l
45	İ	176	00111001110011	2	1	176	111001111111000	4	l
40		177	00111001100111	2	1	177 178	111100000011111	2	1
	İ	178 179	00111000111110	2		179	11100001100111	2	ł
	}	180	00110011111100	1 2	1	- 180	11100001110011	2	L
		181	00110011111001	2		181 182	11100001111001	2	l
50	1	182 183	00110011110011			183	11100011000111	2	
		184	00110011001111	2		184	11100011001110	2	1
		185	00110001111110	2	1	185 186	11100011100011	2	
		186	00110000111111	- 2	1	187	11100011110001	2	
		188	00111111100011	4	1	188	11100011111000	2	
55		189	00111111001110		1	189 190	11100110000111	2222222222222	l
	ļ	190	001111100011110			191	11100110011001	2	-
	ı	1	,	• '		•	•	•	•

Tabelle 4 (CDS \geq 0)

	Klasse	8-Bit- Daten	Modulationscodes,	CDS	Klasse		Modulations codes,	CDS
<i>5</i>		192	00111110001111	4.		Daten 192	11100110011100	2
10	2(A)	193 194 195 196 197	00111100111110 00111100011111 0011100111111	*****		193 194 195 196 197 198	11100111000011 11100111000110 11100111001100 11100111100001 11100111110000	222220
15		199 200 201 202 203 204 205 206	00011111100001 00011111001100 00011111000110 000111110011100 00011110011001 00011110001110	00000000	3 (8)	199 200 201 202 203 204 205 206	11100000011110 11100000110011 11100000111001 11100000111100 11100001100011 1110000110001	00000000
20		207 208 209 210 211 212 213 214	00011100111100 00011100111001 00011100110011 00011100011110 00011100001111 00011001111100 00011001111001	00000000		207 208 209 210 211 212 213 214	11100011000011 11100011000110 11100011001100 11100011100001 11100011110000 11100110000110 11100110000110	00000000
25	3 (A)	215 216 217 218	00011001100111 00011000111110 00011000011111 000111111	0 0 0 2		215 216 217 218	11100110011000 11100111000001 11100111100000	0 0
30		219 220 221 222 223 224 225	00011111100110 00011111100011 00011111001110 00011111001111 00011110011111 00011110011111	NNNNNNNN		219 220 221 222 223 224 225	11110011111000 11110000001111 11110000011011	4222222
35		226 227 228 229 230 231 232	00011100011111 00011001111110 0001100011111 000111111	2224444	4 (B)	226 227 228 229 230 231 232	11110001100110 11110001110001 11110001111000 11110011000011 11110011000110 11110011001100	2222222222222
40	4 (A)	233 234 235 236 237 238 239	0001110011111 00001111111000 00001111110001 00001111100110 00001111100111 00001111001111	400000		233 234 235 236 237 238 239	11110011110000 11110000000111 1111000000	2000000
45		240 241 242 243	00001110011110 00001110001111 00001100111110 00001100011111	0000		240 241 242 243	11110001100001 11110001110000 11110011000001 11110011100000	0 0 0
50		244 245 246 247 248 249	00001111111001 00001111110011 00001111100111 00001111001111 000011100111111	*****	5 (B)	244 245 246 247 248 249	11111000000111 11111000001110 11111000011001 11111000011100 11111000111000	2 2 2 2 2 2
55	5 (A)	250 251 252 253 254 255	00000111111100 00000111111001 00000111110011 00000111100111 00000111001111	00000		250 251 252 253 254 255	11111000000011 11111000000110 11111000011000 11111000110000 11111001100000	0 0 0 0 0

Tabelle 5 (CDS \leq 0)

5	Klasse	8-Bit- Daten	Nodulationscodes, beginnend mit *0*	CDS	Klasse	8-Bit- Daten	Modulationscodes, beginnend mit "1"	CDS
		0	01111110000001 01111100110000	0		0	10000001111110	0
10		2 3 4 5 6 7	01111100011000 01111100001100 01111100000110 011111000000	00000		234567	1000001110011 1000001111001 10000011111001 1000011000111 10000110001111	000000
15	:	8 9 10 11 12 13	01111000111000 01111000110001 01111000011100 01111000011001 01111000000	00000		8 9 10 11 12 13	10000111000111 10000111001110 10000111100111 10000111100110 1000011111000 10000111111	000000
20		14 15 16 17 18 19 20	01110011110000 01110011100001 01110011000110 01110011000110 011100011110001	000000		14 15 16 17 18 19	10001100011110 100011001110011 10001100111001 10001100111100 1000111000111	00000
25		21 22 23 24 25 26	01110001100110 01110001100011 01110000111100 01110000111001 01110000110011	000000		21 22 23 24 25 26	10001110011001 10001110011100 1000111100011 1000111100110 10001111001100 10001111100001	000000
30		27 28 29 30 31 32	01110000001111 01100111110000 01100111100110 01100111000110 01100111000011	000000		27 28 29 30 31 32 33	100110000011111 10011000011110 10011000110011 10011000111001 10011000111100	000000
35	1 (C)	33 34 35 36 37 38	01100110011100 01100110011001 011001100	000000	1(0)	34 35 36 37 38 39	10011001100110 10011001110001 100110011	0 0 0 0
40		39 40 41 42 43 44 45	01100011100011 01100011001110 01100011000117 011000011111001 01100001111001	00000		40 41 42 43 44 45	10011100011100 10011100110001 10011100111000 1001111000011 1001111000110	000000
45		46 47 48 49 50	01100001100111 01100000111111 011000000111111	0002-2-2		46 47 48 49 50 51	10011110011000 10011111000001 1001111111	0004444
50		52 53 54 55 56 57	01111000011000 01111000001100 01111000000	-2 -2 -2 -2 -2		52 53 54 55 56 57	100000110011 10000001110001 10000001111000 10000011000011 10000011000110	
55		58 59 60 61 62 63	01110001110000 0111000110000 0111000011000 0111000011100 0111000001100	-2 -2 -2 -2		58 59 60 61 62 63	10000011100001 10000011110000 10000110000011 10000110000110	-6 -6 -6

Tabelle 5 (CDS \leq 0)

	Klasse	8-Bit-	Modulationscodes,	CD8	Klasse	8-Bit-	Hodulationscodes,	CDS	
5		Daten	beginnend mit "0"			Daten	beginnend mit "1"		
		64	01110000001110	-2		64	10000110011000	-6	
		65 66	01110000000111	-2 -2		65 66	10000111000001	-4	١
		67 68	01100111000001	-2 -2		67 68	10001100000011	-4	
10		69	01100110001100	-2		69	10001100001100	-4	
		70 71	01100110000110	-2		70 71	10001100011000	-4	
		72	01100011110000	-2		72 73	10001110000001	-4	
		73 74	01100011100001 01100011001100	-2 -2		74	100110000000011	-4	
15		75 76	01100011000110	-2 -2		75 76	10011000000110	-4 -4	
	* 5	77	01100001111000	-2		77	10011000011000	-4	
	1 (C)	78 79	01100001110001	-2 -2		78 79	10011000110000	-4	
	1107	80	01100001100011	-2		80 81	10011100000001	-4 -2	
20		81	01100000111100	-2 -2		82	10000001100111	-2	١
		83	01100000110011	-2 -2		83 84	10000001110011	-2 -2	
	İ	85	01100000011110	-2		85	10000001111100	-2 -2	١
	7	86 87	01110000110000	-4		86 87	10000011001110	-2	
25		88	01110000001100	-4	1 1	- 88 - 89	10000011100011	-2 -2	
		89 90	01100110000001	-4		90	10000011110001	-2	
		91	01100001110000	-4		91 92	10000011111000	-2 -2	
		93	01100000111000	-4		93 94	10000110001110	-2 -2	
30		94	01100000110001	-4		95	10000110011100	-2	ĺ
		96	01100000011001	-4		96 97	10000111000011	-2 -2	ļ
		98	00111000001100	-4	1 (D)	98 99	10000111001100	-2 -2	١
		100	00111111000000	-2 -2	•	100	10000111110000	-2	۱
35		101	00111100110000	-2		101 102	10001100000111	-2 -2	١
		102	00111100011000	-2		103	10001100011001	-2	1
	·	104	00111100000110		<i>:</i> .	104	10001100011100	-2	1
40		106	00111001110000	-2		106	10001100111000	-2 -2	İ
40		107	00111001100001			107	10001110000011	-2	1
		109	00111000110001	-2		109	10001110001100	-2	
	2 (C)	110	00111000011100	-2		- 111	10001111000001	-2	1
45	5,07	112	00111000001110	-2	•	112	100011111100000	-2	1
₩.		114	00110011110000	-2	1	114	10011000001110	-2	1
		115	00110011100001			115	10011000011100	-2	1
		117	00110011000110	-2		117	10011000110001	-2 -2	1
50		118	00110011000011	-2	1	119	10011001100001	-2	1
-		120	00110001110001	_		120	10011001110000	-2 -2	
		122	00110001100011	-2		122	10011100000110	-2 -2	
		123	00110000111100			123	10011100011000	-2	
55		125	00110000110011	-2	l	125 126	10011100110000	-2 -2	
••		126	00110000011110			127	10011111000000	-2	
	1	,		1	1	 		1	4

Tabelle 5 (CDS \leq 0)

	Klasse	8-B1t-	Modulationscodes,	CDS	Klasse	8-Bit-	Modulationscodes,	CDS
6		Daten	beginnend mit "0"			Daten	beginnend mit "1"	
		128	00111111100000			128	11000000011111	0
10		129 130 131 132 133 134	00111111000001 00111110011000 00111110001100 00111110000110 001111100111000	000000		129 130 131 132 133 134	11000000111110 11000001100111 11000001110011 11000001111001 11000001111100	000000
15		135 136 137 138 139 140	00111100110001 00111100011100 00111100011001 00111100001110 0011110010111	000000		135 136 137 138 139 140	11000011001110 11000011100011 11000011110001 1100001111000 11000110000111 11000110001110	0 0 0 0 0
20	2 (C)	142 143 144 145 146 147 148	00111001100110 00111001100011 00111000111100 00111000111001 00111000110011 00111000011110	000000		143 144 145 146 147 148	11000110011001 11000110011100 1100011100011 11000111000110 1100011100100	0000000
25		149 150 151 152 153 154	00110011111000 00110011110001 00110011100110 00110011100111 00110011001111	000000		149 150 151 152 153 154 155	11001100001110 11001100011001 11001100011100 11001100110001 11001100111000	00000
30		156 157 158 159 160 161	00110001111001 00110001110011 00110001100111 00110000111110 00110000011111	00000+		156 157 158 159 160 161	11001110000110 11001110001100 11001110011000 11001111000001 11001111100000	00000
35		162 163 164 165 166	00110001100001 00110000111000 00110000110001 0011000001100 00110000011001	-6 -6 -6 -6	2 (D)	162 163 164 165 166	11000000110011 11000000111001 11000001100011 11000001100110 1100000110001	-2 -2 -2 -2 -2
40		168 169 170 171 172 173 174	00011100011000 00011100001100 000111000000	-4-4-4		168 169 170 171 172 173	11000011111000 110000110000110 11000011001100 1100001100001 11000011110000 110001110000011	-2 -2 -2 -2 -2 -2 -2 -2
45	3(C)	175 176 177 178 179 180	00011000011001 00011000000111 00011111100000 00011111000001 00011110001100	-4 -2 -2 -2 -2		175 176 177 178 179 180	11000110000110 11000110001100 1100011000001 1100011100000 11000111000001	-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -
50		181 182 183 184 185 186	00011110000110 00011110000011 00011100111000 00011100110001 00011100011001	-2 -2 -2 -2		181 182 183 184 185	11001100000110 11001100011000 110011001	-2 -2 -2 -2 -2 -2 -4
55		187 188 189 190 191	00011100001110 00011100000111 000110011	-2 -2 -2 -2 -2		187 188 189 190 191	11000000011001 11000000011100 11000000111000 1100000111000	-4 -4 -4 -4

Tabelle 5 (CDS \leq 0)

	Klasse	8-Bit-	Modulationscodes,	CDS	Klasse	8-Bit-	Nodulationscodes,	CDS
	Masse	Daten	beginnend mit "0"		10.000	Daten	beginnend mit "1"	
5	4			_	. 1		11000001510000	-4
		192 193	00011001100011	-2 -2		192 193	11000001T10000 11000011000001	
		194	00011000111001	-2		194	11000011100000	-4
		195 196	00011000110011	-2 -2		195 196	11000110000001	-4
10		197	00011000001111	-2	2(D)	197	11001100000001	-4
		198	00011111110000	. 0		198	11100000001111	8
		199 200	00011111100001	0		199 200	11100000110011	ŏ
	2.0	201	00011111000110	. 0		201	11100000111001	0
	3 (C)	202	00011111000011	0		202 203	11100000111100	0
15		203 204	00011110011100	Ö		204	11100001100110	Ö
		205	00011110001110	0		205	11100001110001	0
	1	206	00011110000111	0		206 207	11100011000011	ŏ
		208	00011100111001	0		208	11100011000110	0
20		209 210	00011100110011	0		209 210	11100011001100	0
	.	211	00011100001111	0		211	11100011110000	0
		212	00011001111100	0		212 213	11100110000011 11100110000110	0
	1: •	213 214	00011001111001	ŏ	1 .	214	11100110001100	0
		215	00011001100111	0	3(D)	215	11100110011000	0
25		216	00011000111110	0		216 217	11100111000001	ŏ
		218	00001110000011	-4	1	218	11100000001110	-2.
	}	219	00001100000113	-4	1 1	219 220	111000000011001 11100000011100	-2 -2
	1 .	220	00001111110000	-2 -2		221	11100000110001	-2
30		222	00001111001100	-2	1	222	11100000111000	-2 -2
00	'	223	00001111000110	-2 -2		223 224	11100001100001	-2
	ł	225	00001110011100	-2		225	11100011000001	-2
	4(C)	226	00001110011001	-2 -2	1 1	226 227	11100011100000	-2 -2
		227 228	00001110001110	-2.		228	11100111000000	-2
35		229	00001100111100	-2	1 1	229 230	11100000001100	-4
		230	00001100111001	-2 -2	1 1	231	11100000110000	-4
		232	00001100011110	-2	1 1	232	11100001100000	-4
		233	00001100001111	-2	 	233 234	111100011000000	-4
40	11.77	234	00001111111000	ŏ	1 . 1	235	11110000001110	0
7 ♥		236	00001111100110	0		.236 237	111110000011001	0.
	1.	237 238	00001111100011	0		238	11110000110001	Ø
		239	00001111000111	0		239	11110000111000	0
		240	00001110011110			240 241	11110001100001	0
45		241	00001100111110		4 (D)	242	11110011000001	0
	<u> </u>	243	00001100011111	0	4	243 244	11110011100000	-2
	- 1	244	00000111111000			245	11110000001100	-2
		245	00000111100110	-2		246	11110000011000	-2
50		247	00000111100011	-2		247 248	11110000110000	-2 -2
W	_	248	00000111000111		<u>L</u> :	249	11110011000000	-2
	5 (C)	250	000001111111100	0		250	11111000000011	0
	1	251	00000111111001			251 252	11111000000110	0
		252 253	00000111110011		5 (D)	253	111111000011000	0
55		254	00000111001111	0		254	11111000110000	0
		255	00000110011111	0	<u> </u>	255	11111001100000	<u> </u>
	L							

Tabelle 12

8-Bit-Datenwert Modulationscode CDS 5 248 2 11111000110001 249 11111000111000 2 10 250 11111001100001 2 251 11111001110000 2 15

Tabelle 13

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20 =			
	8-Bit-Datenwert	Modulationscode	CDS
	248	00000111001110	-2
25	249	00000111000111	-2
	250	00000110011110	-2
30	251	00000110001111	-2

35 Digitales Modulationsverfahren zum Umsetzen von digitalen 8-Bit-Daten in digitale 14-Bit-Modulationscodes, welches

einen Schritt 1 zum Wählen von bis zu vier digitalen 14-Bit-Modulationscodes für jeden digitalen 8-Bit-Datenwert, wobei der digitale 14-Bit-Modulationscode durch Prozeduren gewählt wird, bei denen

- (a) aus den 214 digitalen 14-Bit-Codes ein digitaler Code gewählt wird, in welchem die Anzahl von aufeinanderfolgenden identischen Bits in den ersten 7 Bits 6 oder weniger, von dem zweiten Bit bis zu dem 13. Bit 2 bis 7 und in den letzten 6 Bits 5 oder weniger beträgt, und diese Wählprozedur wiederholt
- (b) aus den bei der Prozedur (a) gewählten digitalen 14-Bit-Codes ein digitaler Code gewählt wird, dessen erstes Bit "0" ist und dessen Codewortsumme CDS einen absoluten Wert gleich 6 oder weniger hat, und diese Wählprozedur wiederholt wird,
- (c) aus den bei der Prozedur (a) gewählten digitalen 14-Bit-Codes ein digitaler Code gewählt wird, dessen erstes Bit "1" ist und dessen Codewortsumme CDS einen absoluten Wert gleich 4 oder weniger hat, und diese Wählprozedur wiederholt wird,
- (d) aus den bei der Prozedur (b) gewählten digitalen 14-Bit-Codes ein digitaler Code gewählt wird, dessen Wert der Codewortsumme CDS 0 ist, der gewählte digitale 14-Bit-Code mit dessen Umkehrcode zu einem Paar zusammengefaßt wird, um aus den beiden digitalen Codes eine Gruppe zu bilden, und diese Wählprozedur wiederholt wird,
- (e) aus den bei der Prozedur (b) gewählten digitalen 14-Bit-Codes ein digitaler Code gewählt wird, dessen Wert der Codewortsumme CDS +2, +4 oder +6 ist, außer den bei der Prozedur (c) gewählten digitalen 14-Bit-Codes ein digitaler Code gewählt wird, dessen Wert der Codewortsumme CDS +2 oder +4 ist, die beiden gewählten digitalen 14-Bit-Codes mit deren Umkehrcodes kombiniert werden, um aus den 4 digitalen Codes eine Gruppe zu bilden, und diese Wählprozedur wieder holt wird, und
- (f) aus den bei den vorangehenden Prozeduren gebildeten Gruppen 256 Gruppen als digitale 14-Bit-

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Modulationscodes gewählt werden,

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einen Schritt 2 zum Wählen einer Gruppe von digitalen 14-Bit-Modulationscodes aus den 256 Gruppen der digitalen 14-Bit-Modulationscodes, wobei die gewählte Gruppe dem eingegebenen digitalen 8-Bit-Datenwert entspricht,

einen Schritt 3 zum weiteren Wählen von mindestens einem digitalen 14-Bit-Modulationscode in der bei dem Schritt 2 gewählten Gruppe, wobei der jeweilige digitale 14-Bit-Modulationscode der Erfordernis genügt, daß an dem Anschlußabschnitt des schon gewählten vorangehenden digitalen 14-Bit-Modulationscodes und des zu wählenden digitalen 14-Bit-Modulationscodes die Anzahl von aufeinanderfolgenden identischen Bits 2 bis 7 ist, und

einen Schritt 4 zum weiteren Wählen eines digitalen 14-Bit-Modulationscodes aus den bei dem Schritt 3 gewählten Modulationscodes in der Weise umfaßt, daß dieser eine digitale 14-Bit-Modulationscode der Erfordernis genügt, daß der Absolutwert des digitalen Bit-Summenwertes DSV für jedes Bit in dem Modulationscode gleich 8 oder weniger ist.

6. Digitales Modulationsverfahren nach Anspruch 5, bei dem der Schritt 3 Prozeduren umfaßt, bei denen dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "10" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "01", "001", "0001", "00001", "000001" oder "0000001" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "01" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "10", "110", "1110", "11110" oder "1111110" sind.

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "100" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "110", "1110", "11110", "111110", "001", "001", "0001", "00001" oder "000001" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "011" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "001", "00001", "000001", "000001", "1110", "1110", "11110" oder "111110" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "1000" endet, irgendelner der digitalen Modulationscodes gewählt wird, dessen erste Bits "110", "1110", "11110", "111110", "001", "0001" oder "00001" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "0111" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "001", "00001", "000001", "000001", "1110", "1110" oder "11110" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "10000" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "110", "1110", "11110", "11110", "111110", "111110", "01", "001" oder "0001" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "01111" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "001", "00001", "000001", "000001", "110" oder "1110" sind,

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "100000" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "110", "1110", "11110", "111110", "01" oder "001" sind, und

dann, wenn der schon gewählte vorangehende digitale Modulationscode mit "011111" endet, irgendeiner der digitalen Modulationscodes gewählt wird, dessen erste Bits "001", "0001", "00001", "000001", "10" oder "110" sind.

7. Digitales Modulationsverfahren nach Anspruch 5, bei dem der Schritt 4 Prozeduren umfaßt, bei denen dann, wenn der digitale Summenwert DSV an dem Ende des schon gewählten vorangehenden digitalen 14-Bit-Codes +4 oder +2 ist, irgendeiner der digitalen Modulationscodes gewählt wird, dessen Codewortsumme CDS 0, -2, -4 oder -6 ist,

dann, wenn der digitale Summenwert DSV an dem Ende des schon gewählten vorangehenden digitalen 14-Bit-Modulationscodes 0 ist, irgendeiner der digitalen Modulations-codes gewählt wird, dessen Codewortsumme CDS +4, +2, 0, -2 oder -4 ist, und

dann, wenn der digitale Summenwert DSV an dem Ende des schon gewählten vorangehenden digitalen 14-Bit-Modulationscodes -2 oder -4 ist, irgendeiner der digitalen Modulationscodes gewählt wird, dessen Codewortsumme CDS +6, +4, +2, oder 0 ist.

8. Digitales Modulationsverfahren nach Anspruch 5, bei dem die digitalen Modulationscodes die in den nach-

stehenden Tabellen 17 und 18 aufgeführten Codes sind.

Tabelle 17 (CDS \geq 0)

5	Klasse	8-B1t-	Modulationscodes,	CDS	Klasse	8-Bit-	Modulations codes,	CDS
		Daten	beginnend mit "0"			Daten	beginnend mit "1"	
10		0 1 2 3 4 8	01111110000001 01111100110000 01111100011000 01111100001100 011111000000	0000000		0 1 2 3 4 5	10000001111110 10000011001111 10000011100111 10000011110011 1000001111100 10000110001111	00000
15		7 8 9 10 11 12	01111001100001 01111000110001 0111100011100 01111000011001 011110000011001	00000		7 8 9 10 11 12	10000110011110 10000111000111 10000111001110 10000111100110 1000011110011	0 0 0 0 0
20		13 14 15 16 17 18	0111000000111 01110011110000 0111001100	000000		13 14 15 16 17 18	10000111111000 10001100001111 10001100011100 10001100111001 10001100111100 10001110000111	000000
25	1 (26	01110001110001 01110001100110 01110000111001 01110000111001 01110000111011 0111000011110	0000000	1 (8)	20 21 22: 23 24 28 26	10001110001110 10001110011100 10001110011100 10001111000110 10001111001100 10001111100001	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
30		27 28 29 30 31 32	0110000001111 0110011110000 01100111000110 01100111000110 011001100011100	0000000		27 28 29 30 31 32	10001111110000 100110000011110 1001100001110011 10011000111001 10011000111100 100110011000111	000000
35		34 35 36 37 38 39 40	01100110011001 01100110000111 0110001111000 01100011110001 01100011100110	000000		34 35 36 37 38 39 40	10011001100110 10011001110001 100110000111 10011100001110 10011100011001 10011100011100	000000
40		41 42 43 44 45 46 47 48	01100011001110 01100011000111 01100001111001 0110000110011 011000011011	0 0 0 0 0 0		41 42 43 44 45 46 47 48	10011100110001 1001111000011 10011110000011 10011110001100 10011110001100 10011111000001	000000
45		49 50 51 52 53 54 53	01111111000001 0111111001100 0111111000110 0111111	2 2 2 2 2 2 2		49 50 51 52 53 54 55	1000001111110 10000110011111 10000111001111 1000011110011 1000011111001 10000111111	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
50		56 57 58 59 60 61 62	011110001100 0111110001100 0111110000111 01111001111000 01111001110001	2 2 2 2 2 2 2 2 2		56 57 58 59 60 61 62	10001100011111 1000110011110 100011100011110 100011110011110 10001111001110	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
		63 64 65 66	01111001100011 01111000111100 01111000110011	2 2 2 2		63 64 65 66	10001111100110 10001111110001 1000111111	2 2 2 2

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Tabelle 17 (CDS \geq 0)

5	Klasse 8-B		` ·	Klasse	8-Bit- Daten	Modulationscodes, beginnend mit "1"	CDS
10		67 011110000 68 011110000 69 011100111 70 011100111 71 011100111 72 011100111 73 011100110	001111 2 11000 2 10001 2 100010 2 100011 2		67 68 69 70 71 72 73	10011000111110 10011001100111 100110011	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
15		75 011100011 76 011100011 77 011100011 78 011100000 80 011100000 81 011001111 82 011001111 83 011001111	11001	1 (8)	75 76 77 78 79 80 81 82 83	10011100111001 10011100111100 100111100001110 100111100111001 10011110011100 10011111000110 10011111001100	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
20	1 (A)	84 01100111 85 01100111 86 01100111 87 01100110 88 01100110	001110 2 000111 2 011110 2 001111 2		84 85 86 87 88	100111111100001 1001111111000111 11000111111	2 2 4 4 4
25		89 01100011 90 01100011 91 01100011 92 01100011 93 01100011 94 01100001	111001 2 110011 2 100111 2 001111 2 111110 2		89 90 91 92 93 94	1100011100111 11000111100111 1100011111001 11000111111	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
30		95 0111111 97 01111111 98 01111110 99 01111110	011100 4 011001 4 001110 4 000111 4 111100 4 111001 4		96 97 98 99 100 101 102 103	11001110001111 1100111000111 11001111000111 11001111100011 110000111111	4 4 4 4 2 2 2 2 2 2 2 2 2
35		105 01111100 106 01111100 107 01111001 108 01111001 109 01111001	011110 4 001111 4 111100 4 111001 4 110011 4	2 (B)	105 106 107 108 109	11000011111001 11000011111100 11000110001111 11000111000111	2 2 2 2 2 2 2 2
40		112 0111000 113 01110011 114 01110011 115 01110011 116 01110011 117 01110011 118 01110001	111110 4 011111 4 111100 4 111001 4 110011 4 001111 4		110 111 112 113 114 115 116 117	11000111001110 11000111100011 11000111110001 11000111111	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
4 5		119 01100111 120 01100111 121 01100111 122 01100111 124 01100110	111001 4 110011 4 100111 4 001111 4		119 120 121 122 123 124	11001100111100 11001110000111 11001110001110 1100111001100 11001110011100	2 2 2 2 2 2 2
50	2 (A)	125 01100011 126 0111111 127 01111110 128 01111100 129 0011111 130 00111111 131 00111110 132 00111110	000111 6 001111 6 001111 6 100000 0 000001 0		125 126 127 128 129 130 131 132 133	11001111000110 11001111001100 11001111100001 1100111111	2 2 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Tabelle 17 (CDS \geq 0)

	Klasse	8-B1t-	Madal and an anada	CDS		0.74		CDS
5	Masse	Daten	Modulations codes, beginnend mit "0"	ws.	Klasse	8-Bit- Daten	Modulations codes, beginnend mit "1"	
10		134 135 136 137 138 139 140 141 142	00111110000011 00111100111000 00111100111001 00111100011100 00111100001110 0011110000111	00000000		134 135 136 137 138 139 140 141	11000001111100 11000011000111 1100001100110 11000011100110 1100001110001 1100001111000 11000110000111	00000000
15		144 145 146 147 148 149	00111001100110 001110011100 0011100011100 00111000110011 00111000011110 0011100011110	00000000	2 (B)	143 144 145 146 147 - 148 149	1100011001100 1100011000110 11000111000110 1100011100001 1100011110000 110001100000111	000000
20		151 153 153 154 155 156	00110011110001 00110011100110 001100110	0000000		181 182 183 184 188 188	11001100001110 11001100011001 11001100011100 11001100110001 11001110000011 11001110000011	0000000
25	2 (A)	158 159 160 161 162 163	00110001110011 00110001100111 00110000111110 0011000001111 00111111	00002222		158 159 160 161 162 163 164	11001110001100 11001110011000 11001111000001 11001111100100	0 0 0 0 4 4 4
30		168 167 168 169 170	0011111000011 00111110011100 00111110011001 001111100001110 001111100111100 001111001111001	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		165 166 167 168 169 170	11100001111110 11100011001111 1110001110011 11100011110011 11100011111001 111000111111	44444
35		172 173 174 178 176 177 178	00111100110011 00111100011110 001111001111100 00111001111001 00111001110011	2 2 2 2 2 2 2 2		172 173 174 178 176 177 178	11100110011110 11100111000111 111001111001110 111001111100111 11100111110001 11100111111	4 4 4 4 4 4 2
40		180 181 182 183 184 185	00111000011111 00110011111100 00110011111001 001100111100111 00110011100111	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 (B)	180 181 182 183 184 185	11100000111110 11100001100111 11100001110011 1110000111001 11100011000111	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
45		187 188 189 190 191 192 193	00111111100110 00111111100011 00111111000111 0011111000111 00111110001111 001111100111110	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	ا الاستوادي	187 188 189 190 191 192 193	1110001110001T 111000111000110 1110001111000 11100011111000 111001100001110 11100110011001	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
50		194 195 196 197 198 199	00111100011111 001110011111110 00110011	4 4 6 6 6		194 195 196 197 198 199	111001111100001 11100111000110 11100111001100 11100111100001	2 2 2 2 2 2

Tabelle 17 (CDS \geq 0)

	Klasse	8-Bit-					Γ	г —
	10.4236		Hodulationscodes,	CDS	Klasse	8-Bit-	Modulationscodes,	ထာန
5		Daten	beginnend mit "O"			Daten	beginnend mit "1"	1.0
		200	00011111110000	0		200	11100000001111	o l
	- 1	201		ŏ	i i	201	11100000011110	o l
	1 /	20		Ŏ		202	11100000110011	o l
		· 20:	00011111000110	0		203	11100000111001	0
	1.	20		0.		204	11100000111100	0
10	. .	20		. 0		- 205 205	11100001100011	0
	1	201		.0		207	11100001100110	0
	·	20		0		208	11100001110001	0
		20		lŏi	4 (2)	209	11100011000011	ŏ
		21		ă	3 (B)	210	11100011000110	٥I
		. 21		l. ŏ		211	11100011001100	ŏ
15		21:	00011100011110	0		212	11100011100001	.0
15		21:		0	ł .	213	11100011110000	0
		•••		0	l .	'214	11100110000011	0
		21		9	1	218	11100110000110	0
	3 ((A) 211		8	1	217	11100110001100	0
		21	. 1 ::::::::::::::::	l ö	l'	218	11100111000001	6
	1	21		l ŏ		219	11100111100000	ŏI
20	1 '	22		lž		120	11110000001111	2
	1	22		1 2	Ì	221	11110000011110	2
		22:		2		222	11110000110011	2
	1	22:		2		223	11110000111001	2
		22		2	ŀ	224	11110000111100	2
		32		1 3		128	11110001100011	2
	r .	22		2 2	1.	226	11110001100110	2 2
25	ı	22		2	l	228	11110001110001	2
		22		1 2	ŀ	229	11110011000011	2
		23		14		230	11110011000110	2
		23		14	4 (B)	231	11110011001100	2
	- 1	23		14	1	232	11110011100001	2
	i i	23		4_	1	233	11110011110000	2 .
30		23		10		234	11110000000111	0
	1	23		0	İ	235	111110000001110	0
	j	23		1 0	1	236	11110000011001	0
		23		8		238	11110000011100	ŏ
	1	23		6	}	239	11110000111000	ŏ
	Į-	24		l ŏ	ł	240	11110001100001	ŏ
	14	(A) 24		Ö	. 1	241	11110001110000	ò
35	1 7	24		٥	1	242	11110011000001	0
	1	24	3 00001100011111	0.	<u> </u>	243	11110011100000	0
	1	24		2	1	344	11111000000111	2
	1	24		2	1 .	245	111111000011100	2
		24	_ 1	2 2	I	248	11111000110001	2 2
	ĺ	24		1 2	1	248	1111100111000	2
40	<u> </u>	23		1-5	- [5 (8)	249	11111000000011	6
-	ļ ·	25		ŏ	1	250	11111000000110	ŏ
		(A) 25		١٥	I	251	11111000001100	0
		1 49	2 00000111100111	0	1	252	11111000011000	0
	1	25		0.	1	283	11111000110000	0
	<u></u> ⊢-:	713 25		- 0	1-8/61	254	11111001100000	~
	<u></u> 6	(A) 25	5 00000011111110	0	B (B)	255	11111100000001	0

Tabelle 18 (CDS \leq 0)

	Klass	e 8	-Bit-	Modulationscodes,	CD\$	Klasse	0.744		1_	П
_		- [aten	beginnend mit "0"	۵۵	AL abou	0-Bit- Daten	Modulationscodes, beginnend mit "1"		۱ ٔ
5				01111110000001	0		0	10000001111110		, 1
			1 2	01111100110000	0 0		1	10000011001111	0	
			3	01111100001100	0		3	10000011100111		
40			5	01111100000011	8:		5	10000011111001	0	
10			6 7		0	٠.	6 7	10000110001111	0	
	ł		8 9		0.		8	10000111000111	Ŏ	
			10	01111000011100	Ō		10	10000111100011	0	ı
			11		0		11 12	10000111100110	0	
15	- 1	i	13 14	01111000000111	0		13 14	10000111111000	8	
			15 16		0		15	10001100011110	0	
		!	17	01110011000110	Ò		16 17	10001100110011	0	
	- 1		18 19	01110011000011	0		16 19	10001100111100	0	
20	1		20 21	01110001110001	0		20 21	10001110001110	0	
			22	01110001100011	0.		22	10001110011100	0.	
			23 24	01110000111100	0		23	10001111000011	0	
	,	(C)	25 26	01110000110011	0	. //	25 26	10001111001100	0	
25	1.	(C)	27 28	01110000001111	0	1 (D)	27 28	10001111110000	0	
			29 30	01100111100001	Ŏ		29	10011000011110	0	
			31	01100111001100	00		30 31	10011000110011	8	
			32 33	01100111000011	00		32 33	10011000111100	0	
30			34 35	01100110011001	0		34 35	10011001100110	.0	
	- 1		36 37	01100110000111	0		36	10011001111000	0	
			38	01100011111000	0		37 38	10011100000111	0	
			39 40	01100011100110	0		39	10011100011001	0	
25		ì	41 42	01100011001110	0		41	10011100110001	0	
35			43	01100001111100	0		43	10011110000011	ō	
			45	01100001111001	0		44	10011110000110	0	
			46	01100001100111	0		46	100111110011000	0	
			48	01100000011111	. 0 -2		48	100111111100000	ō	
40			50	01111001100000	-2		50	10000000111110	-2 -2	
			51 52	01111000110000	-2 -2		51 52	10000001110011	-2	
			\$3 54	01111000001100	-2 -2		53 54	10000001111100	-2 -2	
	ł		55 56	01111000000011	-2 -2		55	10000011001110	-2	
45			57	01110011100000	-2		56 57	10000011100011	-2 -2	
	1		58 59	01110001110000	-2 -2		58 59	10000011110001	-2 -2	
		į	60 61	01110000111000	-2 -2		60	10000110000111	-2 -2	
			62 63	01110000011100	-2 -2		62	10000110011001	-2	
50	l		64	01110000001110	-2		63	10000110011100	-2 -2	
	1		65 66	01110000000111	-2 -2		65 66	10000111000110	-2 -2	

Tabelle 18 (CDS \leq 0)

Date		Klasse	8-Bit-	Modulationscodes,	cos	Klasse	8-Bit-	Modulationscodes,	CDS	٦
10	5			•						
10			67	01100111000001	-2		67	10000111100001	-2	٢
10				01100110011000		ŀ				
10										į
10		1		01100110000011						İ
1	10			01100011110000	_	1	72	10001100011100		
1 (G) 776 0110001100011 -2 775 10001110000110 -2 776 0110001110001 -2 777 100001110001 -2 778 100001110001 -2 778 100011100010 -2 778 100011100010 -2 779 10001110000 -2 779 10001110000 -2 779 10001110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 100011110000 -2 779 10001110000 -2 779 10001110000 -2 779 10001110000 -2 779 10001110000 -2 779 10001100000 -2 779 1000110000 -2 779 1000110000 -2 779 1000110000 -2 779 1000		1 .								
1 (G)		1		01100011000110						ľ
1 1 1 1 2 7 8 01100001100011 -2 7 7 1010001100011 -2 7 8 1001110000001 -2 8 1 101011000000 -2 8 1 101011000000 -2 8 1 101010000011 -2 8 1 101010000000 -2 8 1 101010000000 -2 8 1 101010000000 -2 1 1 1 1 1 1 1 1 1			77	01100011000011						
15		1 (0	78							
20	15							10001111000001	-2	
20		- 1								
20				01100000111001	-2		82	10011000001110		
20	•			01100000110011				10011000017001		
20			85	01100000001111						
25 30 00111001100000 -4 88 1001110000011 -2 -2 -2 -2 -2 -2 -2	20					1 (0)		10011000111000	-2	
Second S						• (0)				
25 91 0011100000110 -4 92 10011100001100 -2 93 001110100000101 -4 92 10011100110000 -2 94 0011001100000 -4 94 10011101100000 -2 95 00110011000001 -4 95 10000000110011 -4 96 00110001100000 -4 96 10000000110011 -4 97 1000000111001 -4 97 1000000111001 -4 97 1000000111001 -4 97 1000000111001 -4 97 1000000111001 -4 97 1000000110001 -4 97 1000000110001 -4 97 1000000110001 -4 97 1000000110001 -4 97 1000000110001 -4 97 1000000110001 -4 97 1000000110001 -4 97 1000000110001 -4 97 1000000110001 -4 100 100000111000 -4 100 100000111000 -4 100 1000001110001 -4 1000001110001 -4 1000001110001 -4 1000001110000 -4 1000001110000 -4 1000001100001 -4 1000001100001 -4 1000001100001 -4 10000011000001 -4 10000011000001 -4 10000011000001 -4 10000011000001 -4 100000110000001 -4 100000110000001 -4 100000110000001 -4 100000110000001 -4 1000001100000001 -4 100000110000000000000000000000000000				00111000110000	-4		89			
25 92 0011100000011		·				. 1				
25 93 0011100010001 -4 93 10011100110000 -2 95 00110011100000 -4 94 1001111000001 -4 95 100000011001 -4 97 1000000111001 -4 98 0011000111000 -4 98 1000000111001 -4 98 1000000111001 -4 99 1000000111001 -4 99 1000000111001 -4 99 1000000111001 -4 99 1000000111000 -4 99 1000000110001 -4 99 1000000111000 -4 100 100000111000 -4 100 1000000111000 -4 100 1000000111000 -4 100 1000000111000 -4 100 1000000111000 -4 100 1000000110001 -4 100 1000000110001 -4 100 1000000110001 -4 100 10000001100001 -4 100 10000001100001 -4 100 10000001100001 -4 100 10000001100001 -4 10000001100001 -4 10000001100001 -4 100000000000000000000000000000000000		1	92		-					•
30	25							10011100110000	-2	
30 2 (G) 97 00110001100001 -4 98 1000000111001 -4 98 1000000111001 -4 98 10000001110001 -4 98 10000001110001 -4 98 10000001110001 -4 100 10000001110001 -4 100 10000001110001 -4 100 10000001110001 -4 100 10000001110001 -4 100 1000001110000 -4 100 1000001110000 -4 100 1000001110000 -4 100 1000001110000 -4 100 1000001110000 -4 100 1000001110000 -4 100 1000001110000 -4 100 1000001110000 -4 100 1000001110000 -4 100 1000001110000 -4 100 1000001110000 -4 100 1000001110000 -4 100 1000001110000 -4 1000001110000 -4 1000001110000 -4 1000001110000 -4 1000001110000 -4 1000001110000 -4 1000001110000 -4 1000001110000 -4 1000001110000 -4 1000001110000 -4 1000001110000 -4 1000001110000 -4 1000001110000 -4 1000001110000 -4 10000011100000 -4 10000011100000 -4 10000011100000 -4 10000011100000 -4 10000011100000 -4 100000011000 -4 100000000000000000000000000000000000	25									
2 (C) 98 00110000111000 -4 98 1000000110011 -4 98 1000000110011 -4 98 1000000110011 -4 99 1000000110011 -4 99 1000000110011 -4 99 1000000110011 -4 99 1000000110011 -4 99 1000000110011 -4 101 101 101 101 101 101 101 101 101 101 101 101 101 101 -4 101 101 101 100 -4 101 100000111000 -4 102 102 100000110001 -4 102 102 100000110001 -4 103 101 101 100 -4 103 10000011001 -4 103 101 101 1000011001 -4 105 101 101 10000110001 -4 105 101 101 100001100001 -4 105 101 101 100001100001 -4 107 101 101 100001100001 -4 107 101 100001100001 -4 107 101 100001100001 -4 107 101 100001100001 -4 107 100001100001 -4 101 101 100001100001 -4 101 101 100001100001 -4 101 101 1000011000001 -4 101 101 101 1000011000001 -4 101 101 101 10000011000 -4 101 101 10000011000 -4 101 101 101 10000011000 -4 101 101 101 1000001100 -4 101 101 10000011000 -4 101 101 10000011000 -4 101 101 100000011 -4 101 1000000011 -4 101 1000000011 -4 101 100000000000000000000000000000		- { .	96						-	
2 (C)		- 1	1 1					10000000111100	-	
100		2/0	1			1 1				
102 0011110011000 -2 102 10000011000011 -4 104 105 0011110000100 -2 103 1000001100110 -4 105 00111100000110 -2 104 10000011001100 -4 107 0011100000110 -2 105 1000001110000 -4 107 0011100110000 -2 107 1000011000011 -4 107 0011100110000 -2 107 1000011000011 -4 109 0011100110000 -2 108 10000110000110 -4 110 0011100001100 -2 110 1000011000011 -4 111 0011100001100 -2 111 100001100100 -4 112 0011100000110 -2 111 1000011001000 -4 112 113 0011100000110 -2 112 1000011001000 -4 115 001100000110 -2 114 1000110000011 -4 115 001100110000 -2 115 1000110000011 -4 116 001100110000 -2 115 1000110000011 -4 116 0011001100100 -2 117 1000110000011 -4 118 0011001100100 -2 117 1000110000011 -4 118 0011001100100 -2 118 1000110000001 -4 119 0011001100100 -2 118 1000110000001 -4 120 0011001100100 -2 120 100110000001 -4 121 0011000110010 -2 122 1001100000011 -4 122 0011000110010 -2 122 1001100000011 -4 123 0011000110010 -2 123 1001100000011 -4 124 0011000011001 -2 125 1001100000011 -4 125 0011000011001 -2 125 1001100000011 -4 126 0011000011001 -2 127 1000000011100 -4 128 00110000011001 -2 128 1000000111000 -6 128 00110000001111 -2 128 1000000111000 -6 128 00110000001111 -2 128 1000000111000 -6 128 00110000001111 -2 129 11000000011111 0 130 001111100000 0 130 11000000011111 0 131 0011111000000 0 130 11000000011111 0 131 1000000001100111 0 130 1100000001111 0 130 1000000001111 0 130 11000000001111 0 130 10000000000		1 2 10	100	00110000011100	-4	1				
105	30									
105		1				1 1				
106						1 1	111	10000011001100		
107						1 1				
109			107	00111001110000					· ·	
110	35	'								
40		1				1 1				
40						1 1		10000111000001	-4	
40		- 1	1				1 1 =			
116				00111000000111	-2					
117	40]. `								
45										
45		İ						10001110000001	-6	
45		İ								
45			121	1		!				
124	45							10011000011000		
50 125 00110000111001 -2 125 10011100000001 -4 126 10000000111000 -6 127 10000001110000 -6 128 10000001110000 -6 129 100000011110 -2 128 10000001110000 -6 129 1100000011111 0 130 00111111000100 0 2 (D) 131 1100000110111 0 131 132 1000001100111 0 133						i I				
50 127 00110000011110 -2 127 10000001110000 -6 128 1000001110000 -6 129 1100000011111 0 130 130 100000011111 0 131 100000111110 0 131 11000001100111 0 131 11000001100111 0 132 133		1		00110000111001	-2	ĺ	125			
50 128		1							- 1	
50 129 00111111100000 0 129 1100000011111 0 130 00111111000001 0 130 1100000111110 0 131 11000001100111 0 132 11000001100111 0 133 11000001100111 0 133 1300001100111 0 133			128				128			
131 001111110011000 0 2 (D) 131 110000011111 0	50				0			11000000011111	0	
						2 (D)			- 1	
		ţ	132			"				

Tabelle 18 (CDS \leq 0)

	Klasse	-Bit-	Modulations codes,	CDS	Klasse	8-Bit-	Modulationscodes,	CDS
5		Daten	beginnend mit "0"			Daten	beginnend mit "1"	
		133 134 135	00111110000011	000		133 134 135	11000001111001 11000001111100 11000011000111	0
10].	136 137 138	00111100110001 00111100011100 00111100011001	0		136 137 138	11000011001110 11000011100011 11000011100110	0
		139 140 141 142	00111100000111	0		139 140 141 142	11000011110001 110000111111000 11000110000111	0
15		143 144 145	00111001100011	000		143 144 145 146	11000110011001 11000110011100 1100011100011	0 0 0
	2 (C)	147 148 149	00111000110011 00111000011110 0011100001111	000		147 148 149	11000111000110 11000111001100 11000111100001 11000111110000	0
20		150 151 152 153	00110011111000	000		150 151 152 153	11001100000111 11001100001110 11001100011001	000
		154 155 156 157	00110011001110	0 0 0	2 (D)	154 155 156 157	11001100110001 110011000111000 11001110000011	0 0 0
25		158 159 160	00130001110011 00130001100111 00110000111110	000	2 (0)	158 159 160	11001110001100 11001110011000 11001111000001	0 0
		161 162 163 164	00110000011111	-4 -4		161 162 163 164	11001111100000 11000000011110 11000000110011 11000000	-2 -2 -2
30		165 166 167 168	00011110000001 0001110011000 00011100011000	-4		165 166 167 168	11000000111100 11000001100011 11000001100110 11000001110001	-2 -2 -2
		169 170 171	00011100000110 00011100000011 -000110011	-4 -4 -4		169 170 171	11000001111000 11000011000011 11000011000110	-2 -2 -2
35		172 173 174 175	00011000111000	-4 -4 -4		172 173 174 175	11000011001100 11000011100001 11000011110000 11000110000011	-2 -2 -2 -2
	3 (c)	176 177 178	00011000001110	-4 -4 -4 -2		176 177 178 179	11000110000110 11000110001100 11000110011000 11000111000001	-2 -2 -2 -2
40		180 181 182	00011111000001 00011110011000 00011110001100	-2 -2 -2		180 181 182	11000111100000 11001100000011 11001100000110	-2 -2 -2
		183 184 185	00011110000011	-2 -2 -2 -2		183 184 185 -186	11001100001100 11001100011000 110011001	-2 -2 -2 -2
45		187 188 189 190	00011100011100	-2 -2 -2 -2		187 188 189 190	11000000011001 11000000011100 11000000110001	-4 -4 -4
		191 192 193	00011001111000	-2 -2 -2		191 192 193	11000001100001 11000001110000 11000011000001	-4 -4 -4
50		194 195 196	00011000111100	-2 -2 -2 -2		194 195 196 197	11000011100000 11000110000001 110011000000	-4 -4 -6
		198	00011000011110	-2 -2		198 199	11000000110000	-6 -6

Tabelle 18 (CDS \leq 0)

	Klasse 8	-Bit-	Modulationscodes,	cos	Klasse	8-Bit-	Modulationscodes,	CDS
6	1 . 1		•		10.000			
	-	aten	beginnend mit "0"			Daten	beginnend mit "1"	1
	_	200	00011111110000	0		200	11100000001111	0
		201	00011111100001	ŏ		201	11100000011110	ŏ
	1	202	00011111001100	0		202	11100000110011	0
	1.	203	1	0		203	11100000111001	0
10		205	00011111000011	0	. :	204	11100000111100	0
		206	00011110013100	0		205 206	11100001100011	0
		207	00011110001110	ă	l i	207	11100001110001	0
	j .	. 208	00011110000111	ŏ	1	208	11100001111000	ŏ
	3 (C)	209	00011100111100	ŏ		209	11100011000011	ŏ
		210	00011100111001	0	1	210	11100011000110	0
15		211 212	00011100110011	0		211	11100011001100	0
15	j	213	00011100011110	0		212	11100011100001	0
		214	00011100001111	0	•	213 214	111000111110000	0
		215	00011001111001	ŏ		215	11100110000011	ö
		216	00011001110011	lå	- /5\	216	11100110001100	ŏ
		217	00011001100111	ă	3 (0)	217	11100110011000	ŏ
		218	00011000111110	. 0	1 1	218	11100111000001	0
20	<u> </u>	219	00011000011111	<u> </u>	Į į	219	11100111100000	0
		220 221	00001111110000	-2 -2		220 221	11100000001110	-2 -2
		222	00001111001100	-2		222	1110000Q011001 11100000011100	-2
		223	00001111000110	-2		223	11100000110001	-2
		226	00001111000011	-ž		224	11100000111000	-2
		225	00001110011100	-2	1	225	11100001100001	-2
25		226 227	00001110011001	-2		226	11100001110000	-2
		228	00001110001110	-2		227 228	11100011000001	-2
		229	00001110000111	-2 -2		229	11100011100000	-2 -2
	4 (C)	230	00001100111001	-2		230	11100000001100	-4
	1107	231	00001100110011	-2	1	231	11100000011000	-4
	1	232	00001100011110	-2		232	11100000110000	-4
20	1	233	00001100001111	-2		233	11100001100000	-4
30		236	00001111111000	0		234	11110000000111	0
	l l	235 236	00001111110001	0		235	11110000001110	0
		237	00001111100110			236 237	11110000011001	8
	1	238	00001111001110	l ö		238	11110000110001	ŏ
		239	00001111000111	Ŏ		239	11110000111000	ŏ l
	1	240	00001110011110	0	4 (0)	240	11110001100001	0
35		241	00001110001111	0	ישיר	241	11110001110000	0
		243	00001100111110	0	1	242	11110011000001	0
		266	00001100011111	-2	1	243 244	11110011100000	-2
	ŀ	245	00000111100011	-2	1	245	11110000001100	-2
	ł	246	00000111001110	-2	1	246	11110000011000	-2
		247	00000111000111	-2	1	247	11110000110000	-2
40	5 (C)	248	00000110001111	-2		248	11110001100000	-2
		249	00000111111100	8	!	249	111111000000011	0
	[251	00000111111001	l ö	E (n)	250 251	11111000000110	0
	l	252	00000111100111	6	5 (D)	252	11111000011000	ŏ
	ı	253	00000111001111	ŏ	1	253	11111000110000	ŏ
		256	00000110011111	<u> </u>	L	254	11111001100000	0
45	6 (C)	255	00000011111110	0	6 (0)	255	11111100000001	0
TV								

Revendications

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1. Un procédé de modulation numérique pour convertir des données numériques à 8 bits en codes de modulation numériques à 14 bits, ce procédé de modulation numérique étant caractérisé en ce qu'il comprend :

une étape 1 pour sélectionner jusqu'à quatre codes de modulation numériques à 14 bits pour chaque donnée numérique à 8 bits, le code de modulation numérique à 14 bits étant sélectionné par les procédures suivantes :

(a) on sélectionne parmi les 2¹⁴ codes numériques à 14 bits un code numérique dans lequel les nombres de bits identiques consécutifs sont égaux à 5 ou moins dans les 6 premiers bits, à 2 à7 du second bit

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au 13-lème bit, et à 6 ou moins dans les 7 derniers bits, la valeur absolue de la CDS (somme numérique de mot de code) du code numérique sélectionné étant égale à 4 ou moins, et on répète cette procédure de sélection,

- (b) on sélectionne parmi les codes numériques à 14 bits sélectionnés dans la procédure (a), un code numérique dont le premier bit est "0", et dont la valeur de CDS est 0, et on combine le code numérique à 14 bits sélectionné avec son code inversé, pour former un groupe avec les 2 codes numériques, ou bien on sélectionne parmi les codes numériques à 14 bits sélectionnés à la procédure (a), un code numérique dont le premier bit est "1", et dont la valeur de CDS est égale à +2 ou +4, on combine les codes numériques à 14 bits sélectionnés avec leurs codes inversés, et on combine en outre les deux codes numériques à 14 bits sélectionnés à la procédure cidessus, pour former un groupe avec les 4 codes numériques, et on répète cette procédure de sélection, (c) on sélectionne parmi les codes numériques à 14 bits sélectionnés à la procédure (a), un code numérique dont le premier bit est "0", et dont la valeur de CDS est égale à +2, et un autre code numérique dont le premier bit est "1", et dont la valeur de CDS est égale à +2 ou +4, et on combine les deux codes numériques à 14 bits sélectionnés avec leurs codes inversés, pour former un groupe avec les 4 codes numériques, et on répète cette procédure de sélection.
- (d) on sélectionne parmi les codes numériques à 14 bits sélectionnés à la procédure (a), un code numérique dont le premier est bit est "0", et dont la valeur de CDS est égale à +4, et un autre code numérique dont le premier bit est "1" et dont la valeur de CDS est égale à +2, et on combine les deux codes numériques à 14 bits sélectionnés avec leurs codes inversés, pour former un groupe avec les 4 codes numériques, et on répète cette procédure de sélection, et
- (e) on sélectionne pour les codes de modulation numériques à 14 bits 256 groupes parmi les groupes formés dans les procédures ci-dessus;

une étape 2 pour sélectionner un groupe de codes de modulation numériques à 14 bits parmi les 256 groupes de codes de modulation numériques à 14 bits, le groupe sélectionné correspondant à une donnée numérique à 8 bits appliquée en entrée;

une étape 3 pour sélectionner en outre un ou plusieurs codes de modulation numériques à 14 bits dans le groupe sélectionné à l'étape 2, chacun des codes de modulation numériques à 14 bits satisfaisant l'exigence selon laquelle le nombre de bits identiques consécutifs dans la partie de jonction du code de modulation numérique à 14 bits précédent déjà sélectionné et du code de modulation numérique à 14 bits à sélectionner, doit avoir l'une des valeurs 2 à 7; et

une étape 4 pour sélectionner en outre un code de modulation numérique à 14 bits parmi les codes de modulation sélectionnés à l'étape 3, de façon que ce code de modulation numérique à 14 bits particulier satisfasse l'exigence selon laquelle la valeur absolue de la DSV (valeur de somme numérique) de bit, pour chaque bit dans le code de modulation, doit être inférieure ou égale à 7.

2. Un procédé de modulation numérique selon la revendication 1, caractérisé en ce que l'étape 3 comprend les procédures suivantes :

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "01", "001", "0001, "00001" et "000001" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "10":

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "10", "110", "1110", "11110" et "111110" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "01";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "110", "1110", "11110", "111110" "01", "0001", "00001", et "000001" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "100';

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "001", "0001", "00001", "000001", "10", "110", "1110", et "111110" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "011";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "110", "1110", "11110", "01", "001", "0001" et "00001" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "1000";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "001, "0001", "00001, "000001", "110", "1110" et "11110" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "0111";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "110", "11110", "11110", "01", "001" et "0001" lorsque le code de modulation numérique précédent

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qui a déjà été sélectionné se termine par "10000";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "001", "00001", "000001", "10", "110" et "1110" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "01111";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "110", "1110", "11110", "111110", "01" et "001" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "100000";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "001", "00001", "000001", "000001", "10" et "110" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "011111";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "110", "1110", "11110", "111110", et "01" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "1000000"; et

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "001", "0001", "00001", "000001" et "10" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "0111111".

- 3. Un procédé de modulation numérique selon la revendication 1, caractérisé en ce que l'étape 4 comprend les procédures suivantes :
 - on sélectionne l'un quelconque des codes de modulation numériques dont les CDS sont égales à 0, -2 et -4, lorsque la DSV à la fin du code de modulation numérique à 14 bits précédent qui a déjà été sélectionné est égale à +2;

on sélectionne l'un quelconque des codes de modulation numériques dont les CDS sont égales à +2, 0 et -2, lorsque la DSV à la fin du code de modulation numérique à 14 bits précédent qui a déjà été sélectionné est égale à 0; et

on sélectionne l'un quelconque des codes de modulation numériques dont les CDS sont égales à +4, +2 et O lorsque la DSV à la fin du code de modulation numérique à 14 bits précédent qui a déjà été sélectionné est égale à -2.

4. Un procédé de modulation numérique selon la revendication 1, caractérisé en ce que les codes de modulation numériques qui sont obtenus à l'étape 1 sont les codes indiqués dans les Tableaux 4 et 5 suivants, ou les codes obtenus en remplaçant une partie du Tableau 4 par le Tableau 12 suivant, ou les codes obtenus en remplaçant une partie du Tableau 5 par le Tableau 13 suivant.

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Tableau 4 (CDS ≥ 0)

			4.5			 		
5	L 1	Domées					Ordes de modula-	
5	[].æsse	à	tion commençant	œ	Class		tion començant	CDS
	1 1	8 bits	par "0"			8 bits	bait "J"	F
	4				<u> </u>	<u> </u>	· · · · · · · · · · · · · · · · · · ·	
		0	011111110000001	0	1	0	10000001111110	0
	1 1	1	011111100110000	0	l I	1	10000011001111	ŏ
10		Z	01111100011000	0		2	10000011100111	0
		2 3 4	01111100001100	0	1	3	10000011110011	0
		Š	011111100000011	ŏ		Š	10000011111001	0
	1 1	6	01111001110000	Ŏ	•	6	10000110001111	ŏ
	1 1	7	01111001100001	0		7. •	10000110011110	0
15		8	01111000111000	0		8	10000111000111	0
	1 1	9 10	01111000110001	0		10	10000111001110	0
	1 1	ii	01111000011001	ŏ	i ł	ii	10000111100110	ŏ
		12	011110000001110	0		12	10000111110001	ŏ
		13	01111000000111	0		13	10000111111000	0
20		14	01110011110000	0		14	10001100001111	0
20		16	01110011001100	lŏ		16	10001100110011	ŏ
		17	01110011000110	0		17	10001100111001	ō
		18	01110011000011	0		18 .	10001100111100	0
		19 20	01110001111000	0	.	19 20	10001110000111	. 0
.=		21	01110001100110	١ŏ		21	10001110011001	ŏ
25	1	22	01110001100011	0		22	10001110011100	ŏ
		23	01110000111100	9		23	10001111000011	0.
	1 :	24 25	01110000111001	0		24 25	10001111000110	0
		26	01110000110011 01110000011110	ŏ		26	10001111001100	0
		27	011100000001111	Ŏ	1	27	10001111110000	ŏ
30	1	28	01100111110000	0		28	10011000001111	0
	ı	29	01100111100001	0	1	29	10011000011110	0.
	1	30 31	01100111001100 01100111000110			30 31	10011000110011 10011000111001	0
		32	01100111000011	l ŏ		32	10011000111100	ŏ
	1.,,,	33	01100110011100	0		33	10011001100011	0
35	1 (Y)	34	01100110011001	0	1(8)	34	10011001100110	0
		35	01100110001110	0		35 36	10011001110001	0
		36 37	01100110000111 01100011111000	6		37	10011001111000	0
	1.	38	01100011110001	Ŏ	i :	38	10011100001110	ŏ
	- 1	39	01100011100110	0	i '	39	10011100011001	0
40	1	40	01100011100011	0		40	110011100011100	0
10	•]	41	01100011001110 01100011000111	-0		41	10011100110001 10011100111000	0
		43	01100001111100	ă		43	10011110000011	ŏ
		44	01100001111001	Ŏ		44	10011110000110	ŏ
		45	01100001110011	0		45	10011110001100	0
45		46	01100001100111	0		46	10011110011000	
45		48	01100000111110 01100000011111	0		48	100111111000001	8
	1 .	49	01111111001100	16		49	10000011111110	2
		50	01111111000110	:4	14, 12	50	10000110011111	2
,		2.7 51 / 32	01111111000011	1		51	10000111001111	2
	1	52 53	011111100 11100 01111110011001	1 1		52 53	10000111100111	2 2
50		55	011111110011001 01111110001110	1 7		54	10000111111001	2
	1 .	55.	01111110000111	- 4	l .	55	10000111111100	. 2
•	ł	56	01111100111100	4	•	56	10001100011111	2
	1	57	01111100111001	•	. /	57	10001100111110	2
	1	58	01111100110011	4	l	58 59	10001110001111	2
55		59 60	01111100011110 01111100001111	1	[·	60	10001110011110	2 2
		61	01111001111100	4	1	61	10001111001110	2
		62	01111001111001	-4	Ī	62	10001111100011	2
	ì	63	01111001110011	4	1	63	10001111100110	2

Tableau 4 (CDS > 0)

5	Classe	Données à 8 bits	Codes de modula- tion commençant par "O"	œ	Classe	Données à 8 bits	Codes de modula- tion commençant par "1"	œ	
10		64 65 66 67 68 69	01111001100111 01111000111110 01111000011111 011100111111	******		64 65 66 67 68 69	10001111110001 100011111111000 10011000011111 10011000111110 10011001100111 10011001110011	2222222	
15	-	71 72 73 74 75 76	01110011001111 01110001111110 01110000111111	ندمدد	·	71 72 73 74 75 76 77	10011001111100 10011100001111 10011100011110 10011100110011 10011100111001 10011100111100	22222	
20		77 78 79 80 81 82 83	0110011100111 0110011001111 011000111111	4442222	1 (8)	78 79 80 81 82 83	10011110001110 10011110011001 10011110011100 10011111000110 10011111000110 10011111001100	232333333333333333333	
25		85 86 87 88 89 90	01111110000011 01111100111000 011111001110001 01111100011100 01111100001110 01111100001110	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		85 86 87 88 89 90	10011111110000 10001111100111 10001111100111 1000111111	4666	
30		92 93 94 95 96	01111001111000 01111001110001 01111001100110 01111001100011	222222222		92 93 94 95 96	10011110011110 10011111000111 100111111001110 100111111	6 6	
35	1(A)	97 98 99 100 101 102 103	01111000111001 01111000110011 01111000011110 0111100111111	2 2 2 2 2 2		97 98 99 100 101 102 103	1100011110011 11000111110011 110000011111 110000111111	2 2 2 2	
40		104 105 106 107 108 109	0111001110001 01110011001110 0111001100	2 2 2 2 2 2 2	2 (B)	104 105 106 107 108 109	11000011111001 110000111111100 11000110001111 11000110011110 11000111000111	2222222	
45		110 111 112 113 114 115	01110001100111 01110000111110 01110000011111 01100111111	2222		111 112 113 114 115	11000741100110 11000111110001 11000111111000 11001100001111 1100110001110011	222222222	
50		117 118 119 120 121 122 123	01100111001110 01100111000111 011001100	2222		117 118 119 120 121 122 123	11001100111001 11001100111100 11001110001110 11001110011100 11001110011100 11001110011100	2 2 2 2 2 2 2 2	·
55		124 125 126 127	0110001110011 0110001100111 0110000111111	2 2 2		124 125 126 127	11001111000110 11001111001100 11001111100001 1100111111	2 2	

Tableau 4 (CDS \geq 0)

5	Classe	Données à 8 bits	Codes de modula- tion commençant par "O"	œ	Clæss	Domées à 8 bits	Obdes de modula- tion commençant par "1"	œs	
10		128 129 130 131 132 133	0011111110000 00111111100001 00111111001100 0011111000110 0011111000011 0011111000011	000000	·	128 129 130 131 132 133	1100000011111 1100000111110 11000001100111 11000001110011 11000001111001 11000001111100	0000000	
15		135 136 137 138 139 140	00111100110001 00111100011100 00111100011001 00111100001110 00111001111000	00000		135 136 137 138 139 140	11000011001110 11000011100011 11000011100110 11000011110001 1100011111000 11000110000111	000000	
20		141 142 143 144 145 146	00111001110001 00111001100110 0011100111100 00111000111100 00111000110011 0011100011011	000000	2 (B)	142 143 144 145 146 147	11000110011001 11000110011100 1100011100011 11000111000110 11000111001100		
25		148 149 150 151 152 153	00111000001111 00110011111000 00110011110001 00110011100111 001100111001110	0		148 149 150 151 152 153 154	11000111110000 11001100000111 11001100001100 110011000110	000000	
30		155 156 157 158 159 160	00110001111100	00000		155 156 157 158 159 160	1100111000011 1100111000110 1100111001	0 0 0 0	
35	S (Y)	161 162 163 164 165 166	00111111100001 00111111001100 00111111000110 00111111	2 2 2 2 2 2 2 2 2	_	162 163 164 165 166	11001110011110 11001111000111 11001111001110 11001111100110 11001111100110		
40		168 169 170 171 172 173 174	0011111000011 0011110011110 0011110011001 0011110011011	2 2 2 2 2 2 2	3 (B)	168 169 170 171 172 173	11100011100111 11100011110011 111000111111	4444	
45		175 176 177 178 179 180	00111001111001 00111001110011 00111001110011 00111000111111	1 2		175 176 177 178 179 180	11100111100110 111001111111000 111000000	¥ 2	
50		181 182 183 184 185 186	0011001111100 0011001111001 0011001110011 00110011011	1 2 1 2 1 2 1 2 1 2 1 2		181 182 183 184 185 186 186	11100001111001 11100001111100 11100011000111 11100011100111 11100011100110	2 2 2 2	
55		187 188 189 190 191	0011111110001 0011111100111 0011111100011 0011111001111	1 4		188 189 190 191	111000111111000 111001100001111 11100110001110	2 2	

Tableau 4 (CDS \geq 0)

5	Classe	Données à	Codes de modula- tion commençant	œ	Clæsse	Données à	Codes de modula- tion commençant	œ
-		8 bits	par "0"	G.B	Classe	8 bits	par "1"	
10	2 (A)	192 193 194 195 196 197	00111110001111 00111100111110 00111100011111 0011100111111	0		192 193 194 195 196 197	11100110011100 11100111000011 11100111000110 11100111001100 11100111100001 11100111110000	2 2 2 2 2 2 2 0
: 15	.•	198 199 200 201 202 203 204	00011111110000 0001111110001 0001111100110 0001111100011 0001111001110	00000	3 (8)	199 200 201 202 203 204	11100000011110 11100000110011 11100000111001 1110000111000 11100001100011	00000
20		205 206 207 208 209 210	00011110001110 00011110000111 00011100111100 00011100111001 000111001110011	00000		205 206 207 208 209 210	11100001110001 11100001111000 11100011000011 11100011000110 11100011001100	00000
25	3(A)	211 212 213 214 215 216 217	00011100001111 00011001111100 000110011	000000		211 .212 .213 .214 .215 .216 .217	11100011110000 11100110000011 111001100	000000
30		218 219 220 221 222 223	00011111110001 00011111100110 00011111100011 00011111001110 00011111001111	2 2 2 2 2		218 219 220 221 222 223	11110001111100 11110011111000 1111000000	44222222222
35		224 225 226 227 228 229	0001111000111110 000111000111111 00011000111111	2 2	4 (B)	224 225 226 227 228 229 230	11110000111100 11110001100011 11110001110001 11110001110001 11110011000011	4222222222222
40		230 231 232 233 234 235	00011111001111	4 4 6		231 232 233 234 235 236	11110011001100 11110011100001 11110011110000 1111000000	222000
45	4 (A)	238 239 240 241 242	0000111110011 0000111100011 0000111100111 0000111001111 00001110001111		2	237 238 239 240 241 242	11110000011100 11110000110001 1111000110001 11110001100001 11110011000001	00000
50		243 244 245 246 247 248	0000110001111 0000111111100 0000111111001 0000111100111 0000111001111	2 2 2 2 1 2		243 244 245 246 247 248 249	11110011100000 1111100000111 1111100001100 1111100011100 11111000111000 1111100111000	2 2 2 2 2 2
55	5 (A	269 250 251 252 253 254 255	000011001111 0000011111110 00000111111001 0000011111001 0000011100111	0 0 1 0 1 0 1 0	- 5 (B)	250 251 252 253 254 255	11111000000011 11111000000110 1111100001100 1111100011000 1111100110000	. 0
	L				<u> </u>			

Tableau 5 (CDS ∠ 0)

5	Classe	Dornées à 8 bits	Codes de modula- tion commençant par "O"	008	Clæsse	Données à 8 bits	Codes de modula- tion començant par "1"	œs	
10		0 1 2 3 4 5	01111110000001 01111100110000 01111100011000 0111110001100 01111100000110 011111000110000	000000		0123456	10000001111110 10000011001111 10000011100111 1000001110011 10000011111001 100000111111	00000	
15		6 7 8 9 10 11	01111001100001 01111000111000 01111000110001 01111000011100 01111000011100	000000		7 8 9 10 11 12 13	10000110011110 10000111000111 10000111001110 1000011110011 1000011110001	000000	
20		13 14 15 16 17 18	01111000000111 01110011110000 01110011100010 01110011000110 0111001100011	00000		14 15 16 17 18 19 20	1000110001111 10001100011110 1000110011	000000	
25		20 21 22 23 24 25 26	01110001110001 0111000110011 011100011100 0111000011100 0111000011001 01110000011111	0 0 0		21 22 23 24 25 26 27	10001110011001 100011110011100 1000111100011 1000111100110 1000111100101	00000	
30		27 28 29 30 31 32 33	0111000000111 0110011111000 0110011110000 0110011100110 0110011100011 01100110001110	010000000000000000000000000000000000000		28 29 30 31 32 33	10011000001111 10011000011110 1001100011001 1001100011100 1001100110001	00000	
35	1 (C)	34 35 36 37 38 39	0110011001100 0110011000111 0110011000011 011000111100 0110001110011	0 0		34 35 36 37 38 39 40	1001100111000 1001100111100 1001110000111 1001110001110 1001110001110	000000000000000000000000000000000000000	
40		40 41 42 43 44 45	011000110011 011000110001 0110000111110 011000011100 011000011001	0 0 0 0 0 0 0 0 0 0	0000	42 43 44 45 46	. [1001111100000	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
45		47 48 49 50 51 52 53	011000001111 0110000001111 011111000000 011110011000 011110000110 011110000011	11 01 00 - 00 -	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	48 49 50	100111111000 1000000011001 1000000011100 1000000	11070	
50		54 55 56 57 58 59	011110000001 011110000000 011100111000 01110011000 01110001100 01110001110	11 - 00 - 01 - 00 -	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	55 56 57 58 59 60	1000000111100 1000001100001 1000001100011 1000001110000 1000001111000	00 -6 10 -6 10 -6 00 -6 01 -6	
55		60 61 62 .63	01110000110	01 -	2 -2 -2	61 62 63	100001100000	10 -	•

Tableau 5 (CDS ≤ 0)

5	Clæsse	Domées à 8 bits	Occles de modula- tion commençant par "O"	œ	Classe	Domées à 8 bits	Codes de modula- tion commençant par "1"	œ
10		64 65 66 67 68 69	01110000001110 01110000000111 01100111100000 01100111000001 01100110011000	*******		64 65 66 67 68 69	10000110011000 10000111000001 10000111100000 100011000000	-6-6-6-6
15		70 71 72 73 74 75	01100110000110 01100110000011 011000111100001 011000110001100 01100011000110 0110001100011	-2 -2 -2 -2		71 72 73 74 75 76	10001100110000 10001110000001 10001111000000	-6-6-6
20	1 (C)	77 78 79 80 81 62 83	01100001111000 01100001110011 01100001100110 01100001110011 01100000111001 0110000011001	-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -		77 78 79 80 81 82 83	1001100011000 10011000110000 100111000000	-4 -4 -4 -2 -2 -2
25	,	84 85 86 87 88 89	01100000011110 01100000001111 01110000110000 01110000011000 0111000000	-2 -2 -4 -4 -4		84 85 86 87 88 89	10000001111001 100000011000111 10000011001110 1000001110011 10000011100110 1000001110001	-2 -2 -2 -2 -2 -2 -2
30		91 92 93 94 95	01100001110000 01100001100001 0110000011000 0110000011000 011000000	-6 -6 -6 -6		91 92 93 94 95 96	10000011111000 10000110000111 100001100011001 10000110011001 1000011000111	-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -
35		97 98 99 100 101 102 103	0011100001100 0011111000001 001111100000 0011110011000 0011110001100	-4 -2 -2 -2 -2	1 (D)	98 99 100 101 102 103	10000111001100 10000111100001 10000111110000 10001100000111 10001100001100	ห้าห้าห้าห้า
40		104 105 106 107 108 109	0011110000011 0011110000001 0011100111	-2 -2 -2 1 -2 1 -2 1 -2		104 105 106 107 108 109	10001100011100 10001100110001 10001100011 1000111000011 10001110001100 1000111001100	*****
45	2 (C)	1 112	0011100001110 0011100001100 001110000011 0011100100	1 -2 0 -2 1 -2 0 -2 1 -2		111 112 113 114 115 116	10001111000001 10001111100000 10011000000	******
50		117 118 119 120 121 122	0011001100011 0011001100001 0011000111100 0011000111000 0011000110001	0 -2 1 -2 0 -2 1 -2 0 -2		117 118 119 120 121 122	10011000110001 100110001110001 10011001	-2 -2 -2 -2 -2
55		123 124 125 126 127	0011000011110 0011000011100 001100001100 0011000001111 0011000000	1 -2 1 -2 0 -2		123 124 125 126 127	10011100001100 10011100011000 100111001100001 1001111000000	-2 -2 -2

Tableau 5 (CDS 4 0)

5	Classe		Codes de modula- tion commençant par "O"	OS Clæ	Données ase à 8 bits	Codes de modula- tion commençant par "1"	œ
10		128 129 130 131 132 133	00111111100000 00111111000001 00111110011000 00111110001100 00111110000110 00111111	000000	128 129 130 131 132 133	11000000011111 11000000111110 11000001100111 11000001110011 1100000111100 1100001111100	0 0 0 0 0
15		136 135 136 137 138 139	00111100111000 00111100110001 0011110001100 0011110001100 0011110000110 001111001111000	00000	135 136 137 138 139 140	11000011001110 11000011100011 11000011100110 11000011110001 1100011111000 11000110000111	000000
20	2 (C)	141 142 143 144 145 146	00111001110011 00111001100110 0011100111100 00111000111100 00111000111001 00111000111011	00000	141 142 143 144 145 146	11000110011001 11000110011100 11000111000011 11000111000110 110001110001	
25		148 149 150 151 152 153 154	00111000001111 00110011111000 00110011110011 00110011100110 001100111001110	0	148 149 150 151 152 153	11000111110000 11001100000111 11001100001100 11001100011000 11001100110001	00000
30		155 156 157 158 159	0011000111100 0011000111001 0011000110	0 0	155 156 157 158 159 160	11001110000011 11001110001100 11001110011000 1100111100100	000
35		161 162 163 164 165 166	0011001100000 0011000110000 0011000011100 0011000011000 0011000001110	1 -4 2 0 -4 1 -4 0 -4 1 -4	(D) 161 162 163 164 165 166 167	11000000110011	-2 -2 -2 -2 -2
40	•	167 168 169 170 171 172 173	0001111000000 0001110001100 000111000000	0 -4-	168 169 170 171 172 173	11000001111000 1100001100001 11000011000110 110000110000 1100001110000	-2 -2 0 -2 0 -2 1 -2 0 -2
45	3 (C	174 175 176 177	0001100001110 000110000001 000110000001 000111110000 0001111100110	10 -4 11 -4 10 -2 11 -2 10 -2	174 175 176 177 178 178	2 1100011001100 2 1100011100000	0 -2 0 -2 1 -2 -2
50		180 181 182 183 184 185	00011100011 00011110000 000111100110 000111001110 000111001111	10 -2 11 -2 30 -2 31 -2 50 -2	180 181 182 183 184 185 186		-2 -2 -2 -2 -2 -2 -2 -2
55		186 187 188 189 190 191	000111000110 000111000011 000111000001 000110011110 0001100111001	10 -2 11 -2 00 -2 01 -2	187 188 189 190 191	1100000001100	0 -4

Tableau 5 (CDS ∠ 0)

Classe	i		Domées	Occies de modula-			Domées	Codes de modula-		
192	5	Classe			œ	Classe	à		oos I	
193			8 bits	par "0"			8 bits	per "1"		
195			193	00011000111100	-2		193	11000011000001	-6	
198	10		195 196	00011000110011	-2 -2	2(D)	195 196	11000110000001	-4 -4	
15			198 199 200	00011111110000	000		198 199 200	11100000001111 11100000011110 11100000110011	0	
20	15	3(C)	202 203	00011111000011	00		202 203	11100000111100	0	
25 215 00011001111001 0 216 11100110000011 0 0 215 11100110000011 0 0 215 1110011000011 0 0 215 1110011000011 0 0 216 1110011000011 0 0 216 111001100001 0 0 0 0 0 0	20		205 206 207 208 209 210	00011110001110 00011110000111 00011100111100 00011100111001 000111001110011	00000		206 207 208 209 210	11100001111000 11100011000011 11100011000110 11100011001100 11100011100001	00000	
30 219 0000110000111 -2 220 11100000111010 -2 221 000011111100001 -2 222 11100000111000 -2 222 00001111001100 -2 222 111000011100001 -2 222 0000111000110 -2 222 111000011100001 -2 222 0000111000110 -2 222 111000011100001 -2 222 00001110011100 -2 223 111000011100001 -2 225 00001110011100 -2 224 111000011100000 -2 225 00001110011100 -2 225 11100011100000 -2 225 00001110001110 -2 226 111000011100000 -2 227 00001110001110 -2 228 111000011100000 -2 229 00001100111100 -2 229 1110000001100 -4 230 00001100011110 -2 230 00000110001111 -2 230 00000110001111 -2 231 0000110000111 -2 232 0000110001111 -2 233 0000110000111 -2 233 0000110000111 -2 233 0000011000111 -2 233 0000011000111 -2 233 0000011000111 0 235 00000111100010 0 235 00000111100011 0 236 0000011100011 0 236 0000011100011 0 236 0000011000011 0 237 0000011000011 0 237 0000011000011 0 238 0000011000011 0 239 0000011000011 0 240 000001100011 0 241 000001100001 0 242 0000011000111 0 240 000001100001 0 241 000001100001 0 242 0000011000111 0 245 0000011000011 0 245 0000001100011 0 246 0000011000011 0 247 0000011000011 0 247 000001100011 0 247 0000011000011 0 247 0000001100011 0 247 0000001100011 0 247 0000001100011 0 247 00000000000000000000000000000000000	25		212 213 214 215 216	00011001111100 00011001111001 000110011	000000	3(D)	212 213 214 215 216 217	11100110000011 11100110000110 111001100	00000	
4(C)	30		219 220 221 222 223	00001100000113 00001111110000 00001111100001 00001111001100 00001111000110	-4 -2 -2 -2 -2		219 220 221 222 223	11100000011001 11100000011100 11100000110001 11100000111000	-2 -2 -2 -2 -2	
40 232 00001100011110 -2 233 11100001100000 -4 234 00001111110001 0 235 1111000001110 0 0 236 00001111100011 0 0 235 1111000011001 0 0 236 00001111100011 0 0 235 1111000001110 0 0 236 00001111100111 0 0 236 1111000001110 0 0 237 1111000011001 0 0 238 0000111100011 0 0 238 1111000011001 0 0 238 1111000011000 0 0 239 1111000011000 0 0 239 1111000011000 0 0 240 0000111000111 0 0 241 0000111000111 0 0 241 0000111000111 0 0 241 111100011000	35	4 (C)	225 226 227 228 229 230	00001110011100 00001110011001 00001110001110 00001110000111 00001100111100	-2 -2 -2 -2 -2 -2		225 226 227 228 229 230	11100011000001 11100011100000 111001100	-2 -2 -2 -2 -4	
50 238			232 233 234 235 236 237	00001100011110 00001100001111 0000111111	-2 -2 0 0 0	- <u> </u>	232 233 234 235 236 237	11100001100000 11100011000000 11111000000	-4-0000	
50 245 00000111100010 -2 246 00000111100011 -2 247 000001111000111 -2 248 000001110001111 -2 249 00000110001111 -2 251 00000111111001 0 251 00000111110011 0 252 00000111110011 0 253 0000011100111 0 255 00000111001111 0 5(D) 255 11111000100000 0 0 0 0 0 0 0 0 0 0 0	45		239 240 241 242 243	00001111000111 00001110011110 00001110001111 00001100111111	0000		239 240 241 242 243	11110000111000 11110001100001 11110001110000 11110011000001	00000	
55 (C) 250 00000111111100 0 250 11111000000011 0 251 00000111111001 0 251 111110000000110 0 252 00000111100111 0 252 111111000001100 0 253 11111000011000 0 254 0000011001111 0 255 111111000110000 0 255 11111100011000	50		245 246 247 248	000001111100010	-2 -2 -2 -2		245 246 247 248	11110000001100 111110000011000 11111000110000 111110001100000	-2 -2 -2 -2	
	55	5 (C)	250 251 252 253 254	00000111111100	0 0 0		250 251 252 253 254	11111000000011 111111000000110 11111100001100 111111	00000	

TABLEAU 12

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Données à 8 bits	Codes de modulation	CDS
248 -	11111000110001	2
249	11111000111000	2
250	11111001100001	2
251	11111001110000	.2

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TABLEAU 13

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Données à 8 bits	Codes de modulation	CDS
248	00000111001110	-2
249	00000111000111	-2
250	00000110011110	-2
251	00000110001111	-2

5. Un procédé de modulation numérique pour convertir des données numériques à 8 bits en codes de modulation numériques à 14 bits, ce procédé de modulation numérique comprenant :

une étape 1 pour sélectionner jusqu'à quatre codes de modulation numériques à 14 bits pour chaque donnée numérique à 8 bits, le code de modulation numérique à 14 bits étant sélectionné par les procédures suivantes :

- (a) on sélectionne parmi les 2¹⁴ codes numériques à 14 bits un code numérique dans lequel les nombres de bits identiques consécutifs sont égaux à 6 ou moins dans les 7 premiers bits, à 2à 7 du second bit au 13-ième bit, et à 5 ou moins dans les 6 derniers bits, et on répète cette procédure de sélection,
- (b) on sélectionne parmi les codes numériques à 14 bits sélectionnés à la procédure (a) un code numérique dont le premier bit est "0", et dont la CDS a une valeur absolue inférieure ou égale à 6, et on répète cette procédure de sélection,
- (c) on sélectionne parmi les codes numériques à 14 bits sélectionnés à la procédure (a) un code numérique dont le premier bit est "1", et dont la CDS a une valeur absolue inférieure ou égale à 4, et on répète cette procédure de sélection,
- (d) on sélectionne parmi les codes numériques à 14 bits sélectionnés à la procédure (b) un code numérique dont la valeur de CDS est égale à 0, et on combine le code numérique à 14 bits sélectionné avec son code inversé, pour former un groupe avec les 2 codes numériques, et on répète cette procédure de sélection,
- (e) on sélectionne parmi les codes numériques à 14 bits sélectionnés à la procédure (b) un code numérique dont la valeur de CDS est égale à +2, +4 ou +6, on sélectionne parmi les codes numériques à 14 bits sélectionnés à la procédure (c) un code numérique dont la valeur de CDS est égale à +2 ou

+4, et on combine les deux codes numériques à 14 bits sélectionnés avec leurs codes inversés, pour former un groupe avec les 4 codes numériques, et on répète cette procédure de sélection, et

(f) on sélectionne pour les codes de modulation numériques à 14 bits 256 groupes parmi les groupes formés dans les procédures ci-dessus;

une étape 2 pour sélectionner un groupe de codes de modulation numériques à 14 bits parmi les 256 groupes de codes de modulation numériques à 14 bits, le groupe sélectionné correspondant à la donnée numérique à 8 bits qui est appliquée en entrée;

une étape 3 pour sélectionner en outre un ou plusieurs codes de modulation numériques à 14 bits dans le groupe sélectionné à l'étape 2, chacun des codes de modulation numériques à 14 bits satisfaisant l'exigence selon laquelle le nombre de bits identiques consécutifs dans la partie de jonction entre le code de modulation numérique à 14 bits précédent déjà sélectionné, et le code de modulation numérique à 14 bits à sélectionner, doit avoir l'une des valeurs 2 à 7; et

une étape 4 pour sélectionner en outre un code de modulation numérique à 14 bits parmi les codes de modulation sélectionnés à l'étape 3, de façon que ce code de modulation à 14 bits particulier satisfasse l'exigence selon laquelle la valeur absolue de la DSV de bit pour chaque bit dans le code de modulation doit être inférieure ou égale à 8.

Un procédé de modulation numérique selon la revendication 5, dans lequel l'étape 3 comprend les procédures suivantes :

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "01", "001", "0001", "00001", "000001" et "0000001" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "10".

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "10", "110", "1110", "11110", "111110" et "1111110" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "01";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "110", "1110", "11110", "111110", "1111110", "01", "001", "0001, "00001" et "000001" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "100";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "001", "0001", "00001", "000001", "0000001", "10, "110", "1110", "11110" et "111110" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "011";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "110", "1110", "11110", "111110", "1111110", "01", "0001", "0001" et "00001" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "1000";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "001", "0001", "00001", "000001", "0000001", "10", "110", "1110" et "11110" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "0111"; on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "110", "1110", "11110", "111110", "1111110", "01", "001" et "0001" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "10000";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "001", "0001", "00001", "000001", "0000001", "10", "110" et "1110" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "01111";

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "110", "1110", "11110", "111110", "1111110", "01" et "001" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "100000"; et

on sélectionne l'un quelconque des codes de modulation numériques dont les premiers bits sont "001", "0001", "00001", "000001", "0000001", "10" et "110" lorsque le code de modulation numérique précédent qui a déjà été sélectionné se termine par "011111".

7. Un procédé de modulation numérique selon la revendication 5, dans lequel l'étape 4 comprend les procédures suivantes :

on sélectionne l'un quelconque des codes de modulation numériques dont les CDS sont égales à 0, -2, -4 et -6 lorsque la DSV à la fin du code de modulation numérique à 14 bits précédent qui a déjà été sélectionné est égale à +4 ou +2;

on sélectionne l'un quelconque des codes de modulation numériques dont les CDS sont égales à +4, +2, 0, -2 et -4 lorsque la DSV à la fin du code de modulation numérique à 14 bits précédent qui a déjà été sélectionné est égale à 0; et

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on sélectionne l'un quelconque des codes de modulation numériques dont les CDS sont égales à +6, +4, +2 et 0 lorsque la DSV à la fin du code de modulation numérique à 14 bits précédent qui a déjà été sélectionné est égale à -2 ou -4.

5 8. Un procédé de modulation numérique selon la revendication 5, dans lequel les codes de modulation numériques sont les codes qui sont indiqués dans les Tableaux 17 et 18 suivants.

Tableau 17 (CDS > 0)

5		I						
_	l	Données	Codes de modula-	1	!	Damées		1
	Classe	à	tion commencent	ocs	Clæss	_	tion commençant	ODE
		8 bits	bar "0"		1	8 bits	per "1"	
			01111110000001	•	•			┸
10		i	01111100110000	ŏ	ļ	ů	10000001111110	°
	}	2	01111100011000	0	ŀ	2	10000011100111	ö
		3	01111100001100 01111100000110		ł	3	10000011110011	0
			01111100000011	•	j		10000011111100	
	1	6 7	01111001110000		ł	6	10000110001111	0
15	ł		01111000111000	· ŏ 🛉			10000111000111	
	1.	10	01111000110001	8	,		10000111001110	0
		ii	01111000011001	. 6	1	10	10000111100011	
	1	12	01111000001110	0	ļ	12	10000111110001	ŏ
		1 14	01111000000111	8 1	į	13	10000111111000	0
20		15	01110011100001	0	i	15	10001100011110	0
		16	01110011001100	8	I	16	10001100110011	0
		1.8	01110011000011	Ŏ	l	18	.10001100111100	0
	1	19	01110001111000		i	19	10001110000111	0
		21	01110001100110	0	1	21	1000111001110	
25		22	01110001100011	8	1	12.	100011110011100	0
	1 10	24	01110000111001	0		24	10001111000110	
	1 (A)	25	01110000110011		1 (8)	28	10001111001100	0
	1	27	01110000001111	0	1	27	10001111110000	0
	1	28	01100111110000			28 29	10011000001111	0
30		30	01100111001100	6		30	10011000110011	
	1	31	01100111000110 01100111000011			31	10011000111001	0
	1	33	01100110011100	١،١		32	10011000111100	0
	ł	34	01100110011001	0		34	10011001100110	0
	ļ	35	01100110001110			35	10011001110001	
35		37	01100011111000	0	1	37	10011100000111	ŏ
	1.	38	01100011110001			38	10011100001110	0
	ı	40	01100011100011	0	i	40	10011100011100	0
		41	01100011001110		1	41	10011100110001	o
	1 .	43	01100001111100	0	1	43	10011100111000	
40		44	01100001111001		. 1	44	10011110000110	0
	1 .	46	01100001100111	0		45	10011110001100	.
	•	47	01100000111110		<u></u> 1	47	10011111000001	0
	1	. 49	01111111000001	2]	48	100011111100000	0
		50 51	01111110011000	;	[50	10000110011111	.2
45	٠.	52.	01111110000110	2	ŀ	\$1 \$2	10000111001111	2
	·	57 54	01111110000011		•	83	10000111110011	2
		55	01111100110001	1 2 1	. :	***	10000111111001	2 .
	1	\$6 \$7	01111100011100	2		56	10001100011111	2
	1	58	01111100001110	2 2	. 1	57 58	10001100111110	2
50		59	01111100000111	2		59	10001110011110	2.
	1	60	01111001111000	2 2	1	60	10001111000111	2 2
	1	62	01111001100110	3 2	ı	62	10001111100011	2
		63	01111001100011	1 2	l	63	10001111100110	2
		6.5	01111000111001	2 1	!	65	10001111111000	2
55	1 '	66	01111000110011	2	ı	66 .	10011000011111	2
					•	•	•	•

Tableau 17 (CDS \geq 0)

5								
Ĺ	_	Données	Occides de modula-			Données	Codes de modula-	
f	lææ	à	tion commençant	œ	Classe		tion commencent	œ
L	·	8 bits	bar "O"			8 bits	par "l"	<u> </u>
10		67 68 69 70 71	01111000011110 0111100001111 0111100111110001 011100111100110	2 2 2 2 2	·	67 68 69 70	10011000111110 10011001100111 100110011	2 2 2 2 2 2
15		72 73 74 75 76 77	01110011100011 01110011001110 0111001111000111 011100011111001 011100011110011	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1 (8)	72 73 74 76 76	10011001111100 10011100001111 10011100110011 10011100111001 10011100111100 1001111000111	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
20	1 (A)	78 79 40 81 42 43 84 85 86	0110001100111 0111000011110 0110000011111 01100111111	*******		78 79 40 81 82 43 84 85	10011110001110 10011110011100 1001111100011 10011111000110 10011111001100 100111111	2 2 2 2 2 4
25		87 88 89 90 91 92	01100110011110 0110011001111100 01100011111001 01100011110011	******		85 89 90 91 92	1100011111110 11000110011111 11000111100111 1100011110011 1100011111001	*****
30		93 94 95 96 97 98	01100011001111 01100001111110 01111111001100 0111111	*****		93 94 98 96 97 98	1100011111100 1100T100011111 11001100111110 11001110001111 11001110011110	4444
35		100 101 102 103 104 105 108	0111110001110 01111100111100 01111100111100 01111100111001 0111110011110 01111100011110	*******	2 (B)	100 101 102 103 104 105 106	11001111001110 110011111100111 1100000111111	4 4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
40		108 109 110 111 112 113 114	01111001111001 01111001110011 0111100110011110 01111000111110 011100111111	******	•	108 100 110 111 112 113 114	11600110011110 11000111000111 11000111001110 11000111100111 11000111110001 1100011111000 110011011	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
45		116 117 118 119 120 121	01110011100111 011100110111110 01100111111	•		116 117 118 119 120 121	11001100011110 11001100110011 110011001	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
50		123 124 125 126 127 128	01100111001111 011001101111110 01111111000111 0111111			123 124 125 126 127 128 129	110011110011100 11001111000111 110011110001100 11001111100001 1100111111	2 2 2 2 2 0
55	2 (A)	130	00111111000001	000		130 131 132 133	1100000111110	0

Tableau 17 (CDS \geq 0)

5									
			Codes de modula-		_	Données	Codes de modula-		
	Classe	à	tion commengent	œ	Clææ	à	tion commencent	æ	
		8 bits	bar "O"			8 bits	par "l"		
	,				•	134	11000001111100	0	
10		134	00111110000011	0		135	11000011000111	0	
	1	136	00111100110001	0		136	11000011001110		
		137	00111100011100	8	ì	134	11000011100110	0	
	1	139	00111100001110	0	1	139	11000011110001		
4.		140	0011100000111	;	1	141	11000110000111	9	
15		142	00111001110001	8	ł	143	11000110001110	;	
		143	00111001100110	6	1	iii	11000110011100	0	
		145	00141000111100	1.0		146	11000111000011		
	1	146	0011100011001	0	2 (8)	147	11000111001100	8	
20	<u> </u>	148	00111000011110	1 8	1	149	11000111100001		
20	Ī	149	00110011111000	0	1	150 .	11001100000111	8	ļ
	İ	181 152	00110011110001	1 %	1	151	11001100011001	0	
	· \	153	00110011100011	0	1	183	110011000110001	8	ŀ
•	1	184	00110011001110	8	1	155	11001100111000	0	
25		156	00110001111100		1	155	11001110000011	6	
	1	157	00110001111001			158	11001110001100	8	ŀ
	20	1 1 5 9	00110001100111		1	150	11001110011000	•	
	140	A) 160 161	00110000011111	. 0	1	161	11001111100000	1 %	
	1	167			1	162	11001111110001	14	١
30		163	0011111100011	2		154	11001111111000	14	ł
		161			1	165	11100011001111	4	l
		161	0011111001100	2	ł	167	11100011100111	4	l
	ł	16		1 2	1	169	11100011111001	4.	1
35	- 1	17	0 0011110011110			170	111000111111100	1 4	
30	1	17		1 2	ł	172	11100110011110		1
		17	3 0011110001111		1	173	11100111000111	4	١
	1	17	5 0011100111110	0 2		175	11100111100011		
	l l	17	_			177	11100111110001	4	1
40	•	17	8 001110011001	1 2		178	111001111111000	1 2	
		1	0 0011100001111	12 3		180	1110000011111	2	١
	.	ាំ	001100111111	0 2		3) 181 183	1110000110011	1 2	
	ľ	11	3 001100111100	11 2		183	1110000111100	1 2	
	1	1 1	001100111001	11 1 7		184	1110001111110	1 2	
45	1		6 001100011111			186	1110001100111	9 2	ļ
	1.			7 7 1		187	1110001110011	0 2	Ì
	L	i	89 001111110011	10	٠ ا ١	181	1110001111000	0 2	
		- 1	90 001111110001			191	1110011000011	1 . 2	1
<i>5</i> 0	1	1	92 001111100011	ii	4	192	1110011000111	0 2	١
50			93 001111001111	- 1	1	194	1110011001110	0 2	Į
	1	1	95 001110011111	10	11	190		0 2	
	1	וו	96 001100111111		6	191	7 1110011100110	0 Z	
	1	1 1	98 001111110011		6	19			1
55	L		001111100111			}		•	ł

Données Codes de modula-

Tableau 17 (CDS \geq 0)

Données | Codes de modula-

5	
10	
15	
20	
25	
30	

Classe	à 8 bits	tion començant par "0"	œ	Classe	à 8 bits	tion commençant par "1"	œ
3 (A)	200 201 202 203 204 205 207 206 207 210 211 213 214 215 217	00011111110000 0001111100001 00011111000110 00011111000110 00011110001110 00011110001110 00011110011100 00011100111100 00011100111100 00011100111100 00011100111100 00011100111100 00011001111100 000110011111001 000110011111001 0001100011111001	000000000000000000000000000000000000000	3 (8)	200 201 203 203 204 205 206 207 208 210 211 212 213 214 216 217 218 218	11100000001111 1110000011110 11100000111001 11100000111001 11100001110001 11100001110001 11100001110001 1110001110001 1110001110001 11100011001100 11100011100001 1110011100001 11100110000110 11100110000010 11100110001000	000000000000000000000000000000000000000
	220 221 222 223 224 225 225 227 230 231 231	0001111110001 00011111100110 0001111100111 0001111000111 00011110001111 00011100011110 00011100011111 00011000111110 000111111	22222222224444	4 (8)	210 221 223 224 225 226 227 228 230 231 232 232	1110000001111 11110000011110 1111000011001 1111000011100 11110001100011 1111000110011 1111000111000 1111001100011 1111001100110 11110011001100 11110011100001	
4 (A	234 235 236 237 238 239 240) 241 242 243 244 245 246 247	0000111111000 00001111110001 0000111100111 0000111000111 0000111000111 0000110001111 0000110011110 000011111001 000011111001	000000000000000000000000000000000000000		234 235 236 237 238 239 240 241 242 243 244 245 246 246 247	11110000000111 1111000001100 1111000011000 1111000011000 1111000110000 1111001100000 1111001100000 11111001100000 11111001100000 11111001100000 1111100011000	00000000
5 (248 249 250 251 252 253 253		0 0 0 0	5 (8)	249 250 251 252 263 - 284	1111100000011 1111100000110 1111100001100 1111100011000	00000

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Tableau 18 (CDS \leq 0)

_		Données	Occides de modula-					
5	Classe	à	tion commençant	œ	m	Données		
		8 bits	per "0"	us.	Clææ	à 8 bits	tion començant	œ
	<u> </u>					lo orres	par "1"	
	1	1 9	01111110000001	0		0	10000001111110	0
10	1	2	01111100011000	0		1 2	10000011001111	8
		3	01111100001100	0		3 1	10000011110011	0
	- [5	01111100000011	0		5 6	10000011111001	0
		6 7	01111001110000	0	.	4	10000110001111	
	1		01111000111000	0 .		6	10000111000111	0
15		10	01111000110001	0		10	10000111001110	0.
	. [11	01111000011001	8		11	10000111100110	0
		13	01111000000111	0		13	100001111110001	0
	1	14	01110011110000	0		14	10001100001111	0
		16	01110011001100	Ò	ļ	16	10001100110011	8
20		18	01110011000110	8		17	10001100111001	8
		19 20	01110001111000	0		19	10001110000111	0
		21	01110001100110	8		20 21	10001110001110	0
		22 23	01110001100011	8.		22	10001110011100	0.
25		24	01110000111001	0		.24.	10001111000011-	
	1 (c)	25	01110000110011	0		25 26	10001111001100	0
	1 10)	27 28	01110000001111	Ò	1 (0)	27	10001111110000	0
	- 1	29	01100111110000	8		26 29	10011000001111	8
	1	30	01100111001100	0	1	30	10011000110011	Ö
30		32	01100111000011	ŏ		31 32	10011000111001	
	- 1	33	01100110011100	8		33	10011001100011	Ŏ
	1.	35	01100110001110	0		35	10011001100110	.0
	- 1	37	01100110000111		i i	36 37	10011001111000	8
35		28	01100011110001	0		38	10011100001110	. 0
33		40	01100011100011	ŏ		20	10011100011001	6
		41	01100011001110	0		41 42	10011100110001	0
		43	01100001111100	0		13	10011110000011	8
	1	45	01100001111001	8		45	10011110000110	0
40		46	01100001100111	0		46	10011110011000	0
		48	01100000011111	0		48	100111111000001	8
	1.	50	01111100000001	-2		49	10000000111110	-2
	.	51	-01111000110000	-2		50 51	10000001100111	-2 -2
		52	01111000011000	-2 -2		52	10000001111001	-2
45		. 54	01111000000110	-2	·	54	10000001111100	-2
		56	01111000000011	-2 -2		\$5 56	10000011001110	-2 -2
		57	01110011000001	-2	}	- 57	. 10000011100110	-2
		58 59	01110001110000	-2		58 59		-2 -2
50		60	01110000111000	-2 -2		60	10000110000111	-2
		62	01110000011100	-2	i - I	61		-2
	- -	63	01110000011001	-2 -2	•	63	10000110011100	-2
		65	01110000000111	-2	[·]	65	10000111000110	-2 -2
	•	1 66	[01100111100000	-2	ı (66		-2

Tableau 18 (CDS \leq 0)

5		Données	Occides de modula-		Γ	Dornées	Onder do 2.1	
	Classe	à	tion commencent	œ	m		Occies de modula-	
	1 1	8 bits		œ	Classe	_	tion commençant	oos
	1 1	o cures	par "0"			8 bits	par "1"	l
		1	- Cliffy favor was recorded	-				
10		67	01100111000001	-2		67	10000111100001	-2
10	1	68	01100110011000	-2 -2	1	68	- 10000111110000	-2
	- 1	70	01100110000110	-2	1	70	10001100000111	-2 -2
	ŀ	71	01100110000011	-2		71	10001100011001	-2
	- !	72	01100011110000	-2	1	72	10001100011100	-2
	ì	73	01100011100001	-2 -2		73 74	10001100110001	-2
15		75	01100011000110	-2		75	10001100111000	-2 -2
7.0	- l· .	76	01100011000011	-2		76	10001110000110	-2
	1 (C)	77	01100001111000	-2 -2		77	10001110001100	-2
	- 1	19	01100001100110	-2	1	78	10001110011000	-2 -2
		80	01100001100011	-2	•	80	10001111100000	-2
	1	81	01100000111100	-2	į	81	10011000000111	-2
20		82	01100000111001	-2 -2	ł	82 83	10011000001110	-2 -2
		84	01100000011110	-2	1	84	10011000011100	-2
	ł	85	01100000001111	-2 .	1	85	10011000110001	-2
	 	86	01100000111000	-6	1 (0)	86 87	10011000111000	-2
	1	. 88	. 0011100110000	1-4	1 ''''	88	10011001100001	-2 -2
	1	89	00111000110000	-4	I	89	10011100000011	-2
25		90	00111000011000	-4		90	10011100000110	-2
		91	00111000001100	1=		91	10011100001100	-2 -2
	1	93	00111000000011	1-7	i .	93	10011100011000	-2
	. }	94	00110011100000	-i	1	96	10011110000001	-2
		95	00110011,000001	-4	1	95	10000000110011	-4 [
	1 .	96	000110001110000	1:4	ł	96	10000000111001	*
30	.	9.8	00110001100001	1-4	ł	98	10000000111100	=
	2 (0)	1 66	00110000110001	1-4	ľ	99	100000001100110	-4
	, (v.	1 100	00110000011100	-4	1	.100	10000001110001	-4
	1	101	00111110000001	-2		101	10000001111000	
		103	00111100110000	-2	1	102	10000011000011	
0.5		104	00111100001100	-Z	1	104 .	10000011001100	-4
35	1	105	00111100000110	 -2	1	105	10000011100001	-4 :
		106	00111100000011	-2 -2	1	106	10000011110000	-4 4
	}	108	00111001100001	-2	1	108	10000110000011	
	}	109	00111000111000	-2	1	.109	10000110001100	-4
		110	00111000110001	-2	1	110	10000110011000	-
40		111	00111000011100	-2 -2		111	10000111000001	-:
	· 1	113		-2	1	113	10001100000011	
		116	. 00111000000111	-2	1 .	114	10001100000110	-4
		115	00110011110000	-2	1	115	10001100001100	
		117	00110011100001	-2 -2	ſ	117	10001100011000	1::
		118	- 00110011000110		1	118	10001110000001	
45		119		-2	1	119	10011000000011	-4
	.].	120			1	120	10011000000110	=;
	. 1 .	122	00110001110001		. '	122	10011000001100	- ;
	· '.	123	00110001100011	-2	- 1	123	10011000110000	-4
	•	124	00110000111100	-2	1	124	10011001100000	-4
		125			1	125	10011100000001	-4
50		126 127			1	126	10000000111000	-6
	1	128			`L	128	1000001110000	-6
	· 1	129	00111111100000	0		129	11000000011111	0
		130			2 (0)	130	110000001111110	0
		132			I * (0)	132	11000001100111	0
	•	,	1 44 44 44 44 44 44 44 44 44 44 44 44 44	, ,	•.	,		(

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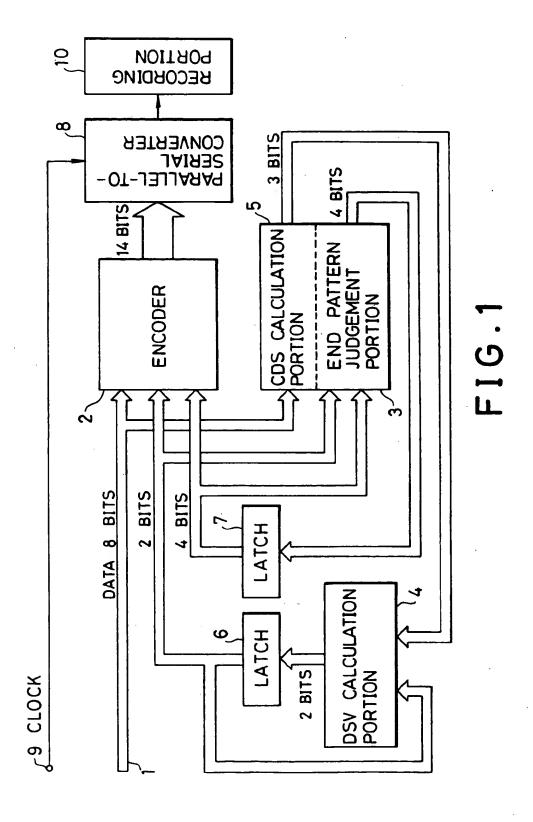
Tableau 18 (CDS ≤ 0)

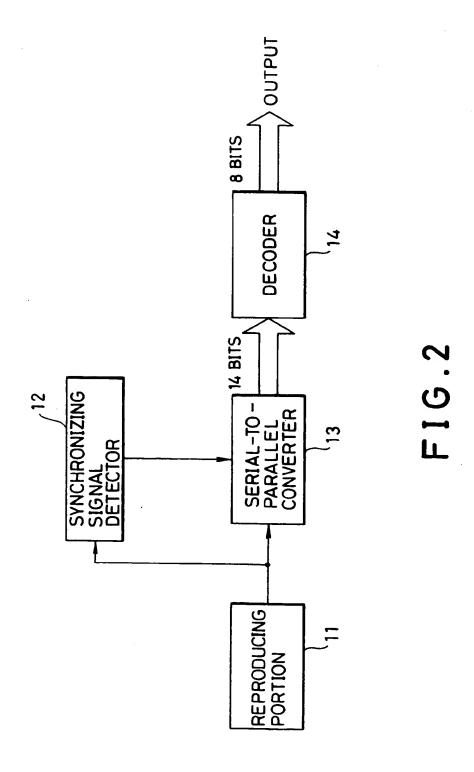
		Denta	lorden de maile			To	0.3- 33 3-	· · · · ·
5	Classe	Données à	Codes de modula- tion commençant	œ	Classe	Données		ام
	Cubbs.	8 bits	par "0"	ub	CLASSE	à 8 bits	tion commençant par "1"	œ
	I	-	par V			o ala	for r	<u></u>
		133	00117110000110	0		133	11000001111001	0
10		135	00111100111000	ŏ		135	11000011000111	ŏ
10		136	00111100110001	0		136 137	11000011001110	0
		138	00111100011100	ŏ		138	11000011100110	0
	1	139	00111100001110	0		139	11000011110001	0
		160	00111100000111	0		140	11000011111000	0
15	1	142	00111001110001	. 0		142	11000110001110	0
,0	-	143	00111001100110	0		143	11000110011001	0
	}	145	00111000111100.	0		145	11000111000011	0
		146	00111000111001			146	11000111000110	0
	2 (C	148	00111000011110	0	i i	148	11000111100001	o
20		149	00111000001111	0		149	110001111110000	0
		151	00110011110001	0		151	11001100001110	0
	1	152	00110011100110	6		152 153	11001100011001	0
		154	00110011001110	8.		156 . 155	11001100110001	0
		156	00110001111100	0		156	11001110000011	0
25		157	00110001111001		2 (0)	157 158	11001110000110 11001110001100	8
	1	159	00110001100111	0		159	11001110011000	0
	· 1 .	160	001100001111110	0	ł	160 161	11001111000001	0
	1	162	00110000011001	-4	1	162	11000000011110	-2
		163	00110000001110	-4	i	163	11000000110011	-2 -2
30		165	00011110000001	-4	1	165	11000000111100	-2
	1	166	0001110011000	1-4	į	166	11000001100011	-2 -2
	1	168	00011100001100	1-4	l .	168	-11000001110001	-2
	Ì	169	00011100000110	1-4		169 170	11000001111000	-2 -2
	1	171	00011001110000	1-4		171	11000011000110	-2
35		172	00011001100001	1-4	1	172 173	11000011001100	-2 ·
	1	174	00011000111000	-4		174	11000011110000	-2
	-	175 176	00011000011100	-4		175 176	11000110000011	-2 -2
	.,,	, 177	00011000001110	-4		177	11000110001100	-2
	3 (0	7 178 179	00011000000111	-4 -2	1	178 179	11000110011000	-2 -2
40	.	180	00011111000001	-2		180,	11000111100000	-2
•		181 182	- 00011110011000	-2 -2		181	11001100000011	-2 -2
	1	183	00011110000110	-2		183	11001100001100	-2
	1 '	184		-2	l	184	11001100011000	-2 -2
15		186	00011100110001	-2	1	-186	11001110000001	-2
45	ſ	187 188	00011100011100	-2	1.	187	11000000011001	
	· 1	189	00011100001110	-2		189	-11000000110001	-6
		190		-2 -2	1	190	11000000111000	-6
		192	00011001110001	-2	1	192	11000001110000	-4
50		193		-2 -2	1	193	11000011000001	-6
	. [195	00011000111100	-2	1	195	11000110000001	-4
	1	196		-2	1	196	11001100000001 11000000011000	-6
	ł	198	00011000011110	[-2	1	198	11000000110000	-6
	•	l 199	00011000001111	-2	<u> </u>	199	11000001100000	-6

Tableau 18 (CDS ≤ 0)

5								
	Classe	Données à 8 bits	Codes de modula- tion commençant par "O"	œ	Classe	Données à 8 bits	Codes de modula- tion commençant par "1"	œ
10		200 201 202 203 204 205	0001111110000 00011111100001 00011111001100 00011111000110	0 0 0 0	. , , , , , , ,	200 201 202 203 204	11100000001111 11100000011110 -11100000110011	0 0 0
15	3 (C)	206 207 208 209 210	00011110011100 00011110011001 00011110001110 0001111000111100	0 0 0 0	•	205 206 207 208 209 210	11100001100110 11100001110001 11100001111000 11100011000011	00000
20		211 212 213 214 215 216 217 218 219	0001110011110 00011100011110 0001110000111100 000110011111001 00011001110011 000110011101110	00000000	3 (D)	211 212 213 214 215 216 217 218 219	11100011001100 111000111100001 1110001111000011 111001100	00000000
25		220 221 222 223 224 225 226	0000111110000 00001111100001 00001111001100 00001111000110 000011110001110	-2 -2 -2 -2 -2 -2		220 221 222 223 224 225 226	11100000001110 11100000011001 11100000011000 1110000011000 1110000110000 1110000110000	-2 -2 -2 -2 -2 -2 -2
30	4 (C)	227 228 229 230 231 232 233	00001110001110 00001110000111 0000110011100 00001100110011 0000110011110 000011000011110	-2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -		227 228 229 230 231 232 233	1110001100001 11100011100000 1110011000001 111000000	-2 -2 -2 -4 -4 -4
35		236 235 236 237 238 239 260	00001111111000 00001111110001 0000111110001 0000111100011 00001111000111 000011110011110	0000000	4 (0)	236 235 236 237 238 239 240	11110000000111 11110000001110 1111000011001 11110000110001 11110000110001 1111000111000	000000
40	non-	263 266 265 266 267	00001110001111 00001100111110 000011101111000 000001111100011 00000111000111	0 0 0 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2		261 262 263 266 265 266 267	11110001110000 11110011000001 11110011100000 1111000000	0 0 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2
45	5 (C)	250 251 252 253	00000110001111 00000111111100 00000111111	2000000	5 (D)	248 249 250 251 252 253 253	1111000110000 11111000000110 11111000001100 11111000011000 11111000110000	-2 0 0 0 0 0
	16 (C)	30.255	00000011111110	· 0 · ,	0 (D) ·	4255 5	⊿ijii ji00000001.	: 0

50





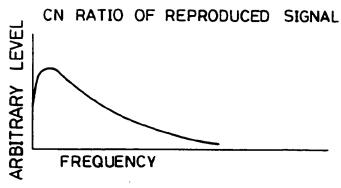


FIG.3A

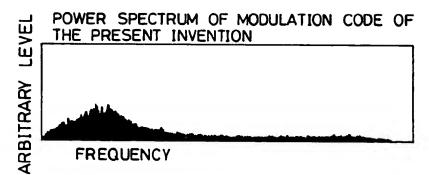


FIG.3B

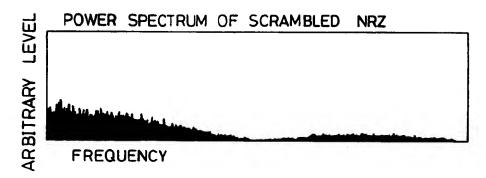
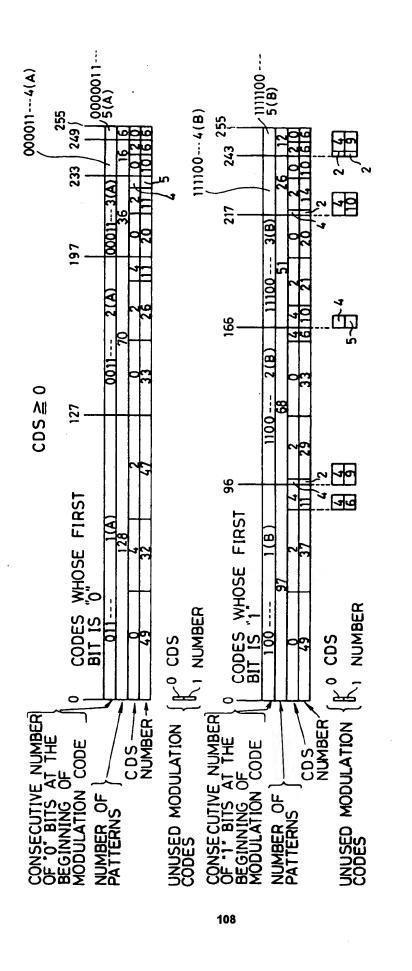
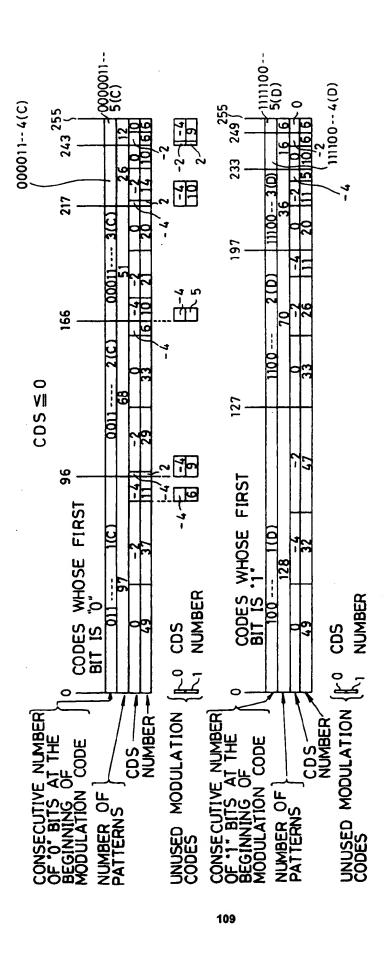


FIG.3C





F16.5

